SPECIFICATIONS FOR

Volume II Technical Specifications for:

Bid No. 6301 - Arvin High School Modernization: Phase 1A Roofing

A#03-123508

DVBE COMPLIANCE AND DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) PUBLIC WORKS COMPLIANCE MONITORING

KERN HIGH SCHOOL DISTRICT
Michael Zulfa, Ed.D., Superintendent

DSA Submittal

Arvin High School
ESSER III Phase 1 Roofing Project

900 Varsity Rd. Arvin, CA 93203

3566002103

File No: 15-H3 A#03-123508

Kern High School District

July 25, 2023

HMC Architects

KHSD ARVIN HS ESSER III PHASE 1 ROOFING PROJECT
ARVIN, CALIFORNIA
DSA SUBMITTAL
25 JULY 2023

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NOT APPLICABLE

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NOT APPLICABLE

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1.01 DESIGN PROFESSIONAL OF RECORD

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 03-123508 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 10/25/2023

A. Architect:
   1. Virginia Marquardt
   2. C-33423

B. Structural
   1. Leslie Tso
   2. S3073

C. Plumbing:
   1. Roger Carter
   2. M-30980

D. Electrical:
   1. Raymond Swartz
   2. E15610

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 03-123508 INC:
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SS ☑ FLS ☑ ACS ☑
DATE: 10/25/2023

SECTION 01 01 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work by Owner.
B. Owner furnished products.
C. Contractor use of site
D. Future work.
E. Owner occupancy.
F. Scope of Work.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 WORK BY OWNER

Items noted 'NIC' (Not in Contract), moveable cabinets, furnishings, minor equipment, etc. will be furnished and installed by the Owner. (Not Part of DSA Approval)

1.04 OWNER FURNISHED PRODUCTS

A. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.

2. Arrange and pay for product delivery to site.

3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.

5. Arrange for manufacturers' warranties, inspections and service.

B. Contractor's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.

2. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.

3. Handle, store, install and finish products.

4. Repair or replace items damaged after receipt.

5. Cooperate with Owner to minimize conflict with Owners right to occupy substantially completed buildings.

6. Coordinate with Owner on Owner furnished product requirements.

1.05 CONTRACTOR USE OF SITE

A. General:

1. Full use of premises and site during construction period.

2. Limited only by Owner's right to employ others or itself to do work on site, according to General Conditions "Separate Contracts".

B. Use of Site:

1. Confined to Contract areas.

2. Maintain entrances to site clear, avoid parking or material storage in these areas.

3. Confine material storage areas to areas designated by the school district.

4. Additional storage area, if required, shall be obtained off-site, and paid for by the Contractor.

1.06 FUTURE WORK

A. Refer to Architectural Site Plan Sheet for areas designated for completion in the future.

1.07 OWNER OCCUPANCY

A. Partial Occupancy: Owner reserves the right to occupy, place and install equipment as necessary in substantially completed buildings. Cooperate with Owner to minimize conflict and facilitate Owner's operations.

B. Acceptance of Work: Partial occupancy does not constitute acceptance of work. Refer to Section 01 70 00, "Procedures" and General Conditions "Occupancy".

1.08 SCOPE OF WORK

1. Replace existing built-up roofing which occurs in Building 1A & 1B, 1C, 2A, 2B, 5B, 7B, 9A, 13, 14 & 15. Remove partial covered walkway and columns. General alterations to site work.

END OF SECTION

SECTION 01 02 70

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

Procedures for preparation and submittal of Applications for Payment.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 SCHEDULE OF VALUES

A. Submit typed schedule on Application and Certificate for Payment Continuation Sheet enclosed.

B. Submit Schedule of Values in duplicate within 10 days after award of Contract.

C. Format: Utilize the format of the "Pay Request Itemization" enclosed in this section. Identify each line item with number and title of the major Specification Section. Identify bonds and insurance.

D. Include separately from each line item, a directly proportional amount of Contractor's overhead and profit.

E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 QUALITY ASSURANCE

A. Prior to start of construction, secure the Architect's approval of the schedule of values required to be submitted per the General Conditions.

B. During progress of the Work, modify the schedule of values as approved by the Architect to reflect changes in the Contract Sum due to Change Orders or other modification of the Contract.

C. Base requests for payment on the approved schedule of values.

1.05 PROCEDURES

A. Informal Submittal: Unless otherwise directed by the Architect:

1. Make an informal submittal or request for payment on a form mutually acceptable to the Owner, the Architect, and the Contractor.

2. Make this preliminary submittal to the Architect at the last regular job meeting of each month, for all work performed from the 26th of the prior month through the 25th of the present month.

3. Revise the informal submittal of request for payment as agreed at the job meeting, initialing all copies.

4. Contractor will not be allowed to project anticipated work to be completed subsequent to the 25th of each month.

B. Formal Submittal: Unless otherwise directed by the Architect:

1. Make formal submittal of request for payment on the form enclosed seven (7) executed copies, signed by the Owner's Inspector.

2. Sign and notarize the Application and Certificate for Payment.

3. Submit the original of the Application and Certificate for Payment to the Architect.

4. The Architect will compare the formal submittal with the approved informal submittal and, when approved, will sign the Application and Certificate for Payment, and will distribute copies to the Owner.

5. The payment request must be complete and have the INSPECTOR'S and ARCHITECT'S signature before the payment request can be considered for processing by the DISTRICT. It is the responsibility of the CONTRACTOR to make sure the payment request is complete before submittal to the DISTRICT.

C. Final Payment Application: The last payment application for the work prepared and submitted by the Contractor preceded by the following administrative actions and submittals, not necessarily by way of limitation:

1. Completion of project closeout requirements (Refer to Section 01700, "Procedures").

2. Completion of items specified for completion.

3. Assurance, satisfactory to Owner, that any unsettled claims will be settled.

4. Transmittal of required project construction records to Owner, including Drawings, Specifications, addenda, Change Orders and other modifications with changes recorded, approved Shop Drawings, Product Data and Samples.

5. Proof, satisfactory to Owner, that taxes, fees, and similar obligations are paid.

6. Removal of temporary facilities, services, surplus materials, rubbish, etc.

7. Change of door locks and other Contractor access provisions to project.

8. Consent of surety for final payment.

9. Filing by the Contractor to the Owner its affidavit, sworn before a Notary Public, for the following:

a. All workers and employed persons have been paid in full.

b. All supplies have been paid in full.

c. All subcontractors have been paid in full.

d. Disputed claims, or notices to withhold items have been filed under Statutes of the State of California.

10. Occupancy permits and similar approvals by governing authorities assuring Owners full access and use of completed work.

11. Warranties, guarantees, maintenance agreements and similar provisions of the Contract Documents.

12. Test/adjust/balance records, maintenance instructions; meter readings, start-up performance reports and similar information.

13. General Construction Completed:

    a. Mechanical and electrical work, fixtures in place connected and ready for testing.

    b. Electrical circuit schedules in panels and disconnect switches labeled.

    c. Painting and special finishes completed.

    d. Doors complete with hardware, cleaned of protective film, relieved from sticking or binding and in working order. Tops and bottoms sealed.

    e. Floors waxed and polished as specified.

    f. Glass cleaned. Broken glass replaced.

    g. Grounds cleared of Contractor's equipment, raked clean of debris, trash removed.

    h. Work cleaned, free of stains, scratches, and other foreign matter, replacement of damaged and broken material, marks and dirt or superfluous labels removed.

14. Advice to Owner on coordination of shifting insurance coverage’s, including proof of extended coverage’s as required.

15. Architect's Certificate of Completion.

PAY REQUEST ITEMIZATION

The following are line item categories to be used when submitting pay requests. Refer to the instructions located on the final page of this document.

GENERAL REQUIREMENTS

Supervision/General Expenses

Clean-up/Maintenance
Bonds
Insurance
Allowances
Temporary Facilities

SITE ITEMS

Electric Service
Gas Service
Water Lateral
Sewer Lateral
Telephone Service

Drainage & Storm Sewer

Fire Lane Paving and Base
AC Paving and Base
Formed Concrete
Concrete Flatwork

Chain Link Fences
Fences and Gates

Landscaping
Irrigation
Off-Site Trees, Planting, Irrigation

Masonry Walls
Waterproofing

Flagpole
Monument Signs
Exterior Signs

Outdoor Play Facilities

Site Fire System
Drinking Fountains

Site Lighting

TYPICAL BUILDING ITEMS (SUMMARY + INDIVIDUAL BUILDINGS)

Excavation & Compaction
Footings & Foundations
Slab on Grade
Concrete Reinforcement
Concrete Columns

Masonry

Structural Steel
Metal Decking
Metal Fabrications
Handrails & Railings

Rough Carpentry
Plywood Web Joists
Glulam Beams
Finish Carpentry
Installation of Doors/Frames/Hardware
Architectural Woodwork

Insulation
Preformed Roofing
Built-up Roofing
Opaque Insulated Panels
Flashing & Sheet Metal
Roof Accessories & Skylights
Sealants

Steel Doors & Frames
Access Doors
Bi-parting Teleslide Door
Overhead Coiling Doors
Entrances and Storefronts
Glass and Glazing
Aluminum Windows
Finish Hardware

Lath and Plaster
Gypsum Wallboard
Ceramic Tile
Acoustical Ceilings
Acoustical Wall Panels
Wood Flooring
Resilient Flooring/Base
Carpet
Special Coatings
Painting

Tack & Marker boards
Toilet Partitions
Cubical Curtains
Louvers/Vents
Directories/Bulletin Boards
Specialty Signs
Metal Lockers

Fire Extinguishers and Cabinets
Operable Partitions
Storage Shelving's
Toilet Accessories
Misc. Specialties

Safes
Stage Curtains
Projection Screens
Shop Equipment
Dock Bumpers
Food Service Equipment/Stainless Steel Tops
Residential Equipment
Photo lab Equipment
Sports Equipment
Laboratory Equipment

Window Treatments
Accessories
Entry Mats
Auditorium Seating
Telescoping Bleachers

Wheelchair Lifts

Fire Sprinkler Systems
Plumbing
HVAC
Energy Management System

Electrical
Underground
- Labor
- Material

Rough
- Labor
- Materials

Finish
- Labor
- Materials

Lighting
Technology

INSTRUCTIONS:

The GENERAL REQUIREMENTS and SITE ITEMS must be listed as the first 2 sections on the first Continuation Sheet for each pay request. The typical building items indicated above must be listed in sub-

groupings for each individual building. Include only the applicable line items for each specific building. (i.e. Theater seating will only appear under the sub-grouping for Building 0300)

The final continuation sheet of each pay request must be a summary indicating the total amounts applicable for the 21 separate portions, General Requirements, Site Items, then Buildings. A grand total for the entire work to that point in time will be the last line on this sheet.

END OF SECTION

SECTION 01 02 80

CHANGE ORDER PROCEDURE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Delivery, Storage, and Handling.

C. Documentation of change in Contract Sum and Contract Time.

D. Change procedures.

E. Construction Change Authorization.

F. Stipulated Sum change order.

G. Unit Price Change Order.

H. Time and Material Change Order.

I. Execution of Change Orders.

J. Correlation of Contractor submittals.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 SUBMITTALS

A. Submit name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Change Order Forms: AIA G701 Change Order, enclosed.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Maintain a "Register of Proposal Requests, Supplemental Instructions, and Change Orders" at the job site, accurately reflecting current status of all pertinent data.

B. Make the Register available to the Architect for review at his request.

1.05 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

A. Maintain detailed records of work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.

B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.

C. On request, provide additional data to support computations:

1. Quantities of products, labor, and equipment.

2. Taxes, insurance and bonds.

3. Overhead and profit.

4. Justification for any change in Contract Time.

5. Credit for deletions from Contract, similarly documented.

D. Support each claim for additional costs, and for work done on a time and material basis, with additional information:

1. Origin and date of claim.

2. Dates and times work was performed, and by whom.

3. Time records and wage rates paid.

4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.06 CHANGE PROCEDURES

A. The Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the General Conditions "Changes and Extra Work" by issuing supplemental instructions on Form G710. A period of 3 working days will be provided to the Contractor to register his complaint in writing for the ASI item. Failure to register a complaint within the 3-day period will result in acknowledgment by the Contractor that the minor change in the Work has no cost or time adjustment and that no claim will be submitted to the Owner.

B. The Architect may issue a Construction Change Authorization Form G713 or a Proposal Request Form G709 which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid and an estimated amount of the change in construction cost. Contractor will prepare and submit an estimate within 7 days. Failure by the Contractor to submit an estimate within the stipulated 7 day time will result in the Architect's estimated amount of the change to the Contract sum or time allowed to complete construction becoming the approved amounts, and acknowledgment by the Contractor that no claim will be submitted to the Owner.

C. The Contractor may propose a change for items other than previously addressed supplemental instructions by submitting a request for information to the Architect which will be returned to the Contractor within 15 days. If the Architects reply necessitates a change in the contract sum or

time, the Contractor shall submit within 15 days a request for change to the Architect. Failure by the Contractor to submit a request for change within the stipulated 14 day period will void the item from being considered at any time during construction and acknowledgment by the Contractor that no claim will be submitted to the Owner. The change request shall describe the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. No additional compensation or time will be considered for the submitted claims at any future date. Document any requested substitutions in accordance with Section 01600, "Substitutions".

1.07 CONSTRUCTION CHANGE AUTHORIZATION

A. Architect may issue a document in the field, signed by the Owner, instructing the Contractor to proceed with a change in the Work, to expedite work and avoid or minimize delays in the work.

B. The document will describe changes in the Work and will designate method of determining any change in Contract Sum or Contract Time.

C. Promptly execute the change in Work. Submit final costs for Work involved and/or change in Contract Time for inclusion in a subsequent Change Order.

1.08 STIPULATED SUM CHANGE ORDER

Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect.

1.09 UNIT PRICE CHANGE ORDER

A. For predetermined unit prices and quantities, the Change Order will be executed on a fixed unit price basis.

B. For unit costs or quantities of units of work which are not predetermined, execute Work under a Construction Change Authorization.

C. Changes in Contract Sum or Contract Time will be computed as specified for Time and Material Change Order.

1.10 TIME AND MATERIAL CHANGE ORDER

A. Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract, with appropriate Contractor costs as determined according to "Changes and Extra Work" of the General Conditions.

B. Architect will determine the change allowable in Contract Sum and Contract Time as provided in the Contract Documents.

C. Maintain detailed records of work done on Time and Material basis.

D. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

1.11 EXECUTION OF CHANGE ORDERS

A. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in this section.

B. Change orders require approval by the Office of the State Architect per California Code of Regulations, Title 21, Section 38 prior to execution of change orders. District may provide a procedure for execution of change orders prior to OSA approval, to facilitate construction scheduling allowing Contractor to proceed.

1.12 CORRELATION OF CONTRACTOR SUBMITTALS

A. Promptly revise schedule of values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

B. Promptly revise progress schedules to reflect any change in Contract Time, revise sub schedules to adjust time for other items of work affected by the change, and resubmit.

C. Promptly enter changes in Project Record Documents.

END OF SECTION

KHSD ARVIN HS ESSER III PHASE 1 ROOFING PROJECT
ARVIN, CALIFORNIA
DSA SUBMITTAL
25 JULY 2023

SECTION 01 04 00

COORDINATION AND MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Coordination.

B. Field engineering.

C. Preconstruction conference.

D. Site mobilization conference.

E. Progress meetings.

F. Preinstallation conferences.

G. Schedules.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later. Contractor shall require each subcontractor to inspect the substrate to receive the work and the conditions under which the work is to be performed. All unsatisfactory conditions shall be reported to the Contractor in writing. Do not proceed with work until unsatisfactory conditions have been accepted by subcontractor in writing. Proceeding with the work constitutes acceptance of the existing conditions.

B. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently for accessibility for other installations, for maintenance, and for repairs. Structural elements take precedence. Penetrations of structural elements require approval of the Architect. Rerouting of ductwork, piping, or conduit around structural, mechanical, or electrical elements are not changes in the work and no claim for additional cost will be allowed.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Contractor and each trade installing concealed work, to which access must be available to the Owner after completion, shall furnish appropriate access doors and frames per Section 08305 of these Specifications for installation by the Contractor. Locations must be suitable for the access required and approved by the Architect.

F. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion.

G. After Owner occupancy of premises, and prior to final acceptance, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.04 FIELD ENGINEERING

A. Employ a Land Surveyor or Civil Engineer with authority to practice land surveying registered in the State of California.

B. Contractor to locate and protect survey control points, before starting work on the site.

C. Preserve permanent reference points during the progress of the work.

D. Do not change or relocate reference points or items of the Work without specific approval from the Architect and the DISTRICT.

E. Promptly advise the Architect when a reference point is lost or destroyed or requires relocation because of other changes in the Work.

1. Upon direction of the Architect, require the field engineer to replace reference stakes or markers.

2. Locate such replacements according to the original survey control.

F. Submit a copy of the registered site drawing and certificate signed by the Land Surveyor or Civil Engineer with authority to practice land surveying that the elevations and locations of the Work are in conformance with the Contract Documents.

G. Record deviations which are accepted (not corrected) on Record Drawings.

1.05 PRECONSTRUCTION CONFERENCE

A. Preconstruction conference will be scheduled to be held within 15 days after Notice to Proceed.

B. Attendance Required: Owner, Inspector, Architect, Contractor, and major Subcontractors and their authorized representatives.

C. Agenda:

1a. Submission of Interim Progress Schedule with status to date.

1b. Submission of "first issue" of the Construction Progress Schedule including sequence of critical work and "submittals for approval."

2. Submission of executed bonds and insurance certificates.

3. Definition of and Distribution of Contract Documents.

4. Review of key dates.

5. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule, including sequence of critical work.

6. Designation and definition of responsibilities of personnel representing the parties in Contract, School Administrative Staff and the Architect.

7. Communications, Construction Change Authorizations (CCA), Requests for Information (RFI), Architects Supplemental Instructions (ASI), Proposal Requests (PR), Change Quotation Requests (CQR) and Change Orders (CO).

8. Field Reports, Daily Log, Record Drawings, Pay Requests and D.S.A. Verified Reports (SSS6).

9. Coordination and meetings, supervision of subcontractors, construction means and methods, testing, deferred approvals, temporary facilities, staging area, clean-up.

10. Submittals, shop drawings, samples, mock-ups, contractor’s approval, substitutions.

11. Rules and regulations governing performance of the work, including prevailing wage rates.

12. Procedures for safety and first aid, security, quality control, stop notice procedure, housekeeping, behavior on school site, etc.

1.06 SITE MOBILIZATION CONFERENCE

A. Architect will schedule a conference at the Project site prior to Contractor occupancy.

B. Attendance Required: Owner, Inspector, Architect, Special Consultants, Contractor's Superintendent, and major Subcontractors and their authorized representatives.

C. Agenda:

1. Interim Progress Schedule with status and second issue of Initial Construction Progress Schedule for approval.

2. Use of premises by Owner and Contractor.

3. Owner's requirements.

4. Construction facilities and controls provided by Owner.

5. Temporary utilities provided by Owner.

6. Survey and building layout.

7. Security and housekeeping procedures.

8. Schedules.

9. Procedures for testing.

10. Procedures for maintaining record documents.

11. Requirements for start-up of equipment.

12. Inspection and acceptance of equipment put into service during construction period.

1.07 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within 2 days to Architect, Owner, participants, and those affected by decisions made.

C. Advise Architect 24 hours in advance of meeting regarding items to be added to agenda.

D. Attendance Required: Contractor's Job superintendent, major Subcontractors and suppliers, Architect, Inspector and others as appropriate to agenda topics for each meeting.

E. Agenda:

1. Review/revise as necessary and approve minutes of previous meetings.

2. Review of Work progress since last meeting.

3. Field observations, problems, and decisions.

4. Identification of problems which impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.

10. Coordination of projected progress.

11. Maintenance of quality and work standards.

12. Effect of proposed changes on progress schedule and coordination.

13. Items requiring proposal requests.

14. Review of outstanding proposal requests.

15. Other business relating to Work.

F. Revisions to Minutes:

1. Unless published minutes are challenged in writing prior to/or at the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.

2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.

3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

1.08 PREINSTALLATION CONFERENCES

A. When required in individual specification Section, convene a preinstallation conference at work site prior to commencing work of the Section.

B. Require attendance of parties directly affecting, or affected by, work of the specific Section.

C. Notify Architect 4 days in advance of meeting date.

D. Prepare agenda, preside at conference, record minutes, and distribute copies within 2 days after conference to participants, with 2 copies to Architect.

E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.09 SCHEDULES

A. SCOPE

1. The work under this section consists of planning, scheduling, and reporting procedures required in conjunction with the progress of the work. The Contractor shall develop a CPM

network schedule demonstrating fulfillment of all contract requirements. The level of detail and submittal procedures are described hereinafter.

2a. The Interim or Preliminary Progress Schedule can be in bar chart format as described, but it will be based on CPM Schedule. The Interim Progress Schedule should be issued at the preconstruction meeting with status/updating being reported at least monthly or at each main meeting prior to the acceptance of the Final Progress Schedule.

2b. Failure to provide an updated schedule each month will cause the current payment request to be held up until an updated job schedule is submitted and verified as being current by the DISTRICT or its representative.

3. The CPM network schedule shall be updated a minimum of once a month at a joint meeting with the Owner, Architect, General Contractor and required subcontractors.

4. Development and maintenance of the construction schedule and supplementary information as detailed hereinafter is the responsibility of the Contractor. Failure of the Contractor to comply with the requirements of this Section shall be grounds for determination that no further progress payments are to be made until Contractor is in compliance.

5. The Contractor shall use the accepted schedule at all times in planning, coordinating, and performing the work under this Contract including all activities of the subcontractors, vendors and suppliers.

6. Conventional Activity on Arrow CPM (I-J) technique shall be utilized. The full duration of the specified Contract time definitions of the terms used herein shall be as set forth in Associated General Contractors (AGC) publication, The Use of CPM in Construction, a Manual for General Contractor's and the Construction Industry, copyright 1976. However, the provisions of this Section shall govern the scheduling, planning, coordination, and performance of the work under this Contract.

7. The Final Progress Schedule shall be:
   a. CPM format.
   b. A detailed CPM format outlined will be per Article 7 of the General Conditions.

B. Contractor's Representative

1. The Contractor shall designate, in writing, an Authorized representative in his firm who will represent the Contractor in the preparation of the CPM schedule and progress of the project. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the Construction Schedule requirements and such authority shall not be interrupted throughout the duration of the project without approval from the Owner.

2. Within 10 calendar days from execution of the Contract, the Contractor shall submit to the Architect/Owner demonstration of competence in use of CPM scheduling. In the event of failure to satisfy Architect/Owner of competence, the Contractor shall be required to employ a

qualified CPM Consultant to be approved by the Architect and Owner. Cost of such CPM Consultant shall be borne by the Contractor at no additional cost to the Owner.

C. The Complete Project CPM Schedule

1. Within 20 working days after receipt of Notice to Proceed the Contractor shall submit the COMPLETE CPM schedule in accordance with all requirements of this section. The COMPLETE CPM shall reflect the Contractor's approach to scheduling the COMPLETE project, including all submittals, procurement and all required testing and operational requirements called for elsewhere in the documents.

2. The schedule shall reflect the term of the contract for the phase(s) as described in the bid documents. The DISTRICT will assist the CONTRACTOR in completing the project. The DISTRICT does not want the project until the end of the contract time and does not plan to take possession of the project until the end of the contract term.

3. The COMPLETE CPM schedule in its original form shall contain no contract changes or delays which may have occurred prior to the acceptance of the COMPLETE CPM schedule. These changes shall be entered at the first update or revision after the COMPLETE CPM schedule has been accepted.

4. Within 10 working days after receipt of the COMPLETE CPM schedule, the Owner and Architect will meet with the Contractor for joint review, correction, or adjustment of the proposal schedule. Within 5 working days after the joint review, the Contractor shall, if necessary, revise and shall resubmit the COMPLETE CPM schedule to the Owner and Architect. The resubmission will be reviewed by the Owner and Architect, and, if found to be as previously agreed upon, will be accepted.

5. The accepted COMPLETE CPM schedule and the computer produced calendar-dated schedule generated therefrom shall constitute the project work schedule until subsequently reviewed in accordance with requirements of this Section.

D. CPM Schedule Requirements

1. CPM schedule shall be per Article 7 of the General Conditions and show the sequence and interdependence of activities required for complete performance of all items of work under the contract or portion thereof. In preparing the CPM schedule the Contractor shall:

   a. Submit a clear, legible, and accurate diagram. Activities related to specific physical areas of the project shall be grouped on the diagram for ease of understanding and simplification.
   b. Submit first COMPLETE CPM schedule without I-J code numbers. All other submittals of updates or revisions shall be made on prints of CPM diagrams which have I-J numbers supplied by the Contractor.

   c. Submit the following for all CPM schedules:
      1. Network diagrams drawn on 30 inch x 42 inch paper.
      2. 1 reproducible transparency of each diagram.
      3. 4 blueline prints of each diagram.

4. 4 copies of the supporting data.

d. Conform the network diagram to the general format illustrated in the Legend.

e. Describe work activities in appropriate segments such that the work is readily identifiable for assessment of progress and competition. Activities labeled "start", "continue", or "completion" are not acceptable.

f. Include the following for each work activity:
   1. Concise description of the work represented by the activity.
   2. Performance responsibility or trade code.
   3. Performance location, or area code.
   4. Duration (in workdays).

g. Schedule the project so that work activities in the CPM schedule shall be durations from 1 workday to 20 workdays with not more that 2 percent exceeding these limits, except as to non-construction activities (such as procurement of materials, deliver of equipment and concrete curing).

h. Include trade or materials restraints to indicate the movement of trades performing major work.

i. Include in the network program separate activities showing:
   1. Preparation and submittal of shop drawings.
   2. Owner and Architect review of shop drawings.
   3. Procurement and delivery of materials and equipment.
   4. Installation and testing of major equipment.
   5. Required delivery for all Owner supplied, Contractor installed items.

j. Include a legend showing:
   1. Each location or area code number and the place or location it refers to.
   2. Each responsibility or trade code number and the trade or entity it refers to.

2. The Contractor shall submit the following supporting data with the submittal of his original CPM construction schedule:

   a. The proposed number of working days per week.

   b. The holidays to be observed during the duration of the contract (by day, month and year).

   c. The planned number of shifts per day.

   d. The number of hours per shift.

   e. The planned usage of major construction equipment on the site, on a monthly basis.

   f. The average weekly manpower usage for each trade to be employed on the project.

   Any changes to the above information shall be submitted with successive updates and revisions.

3. To the extent that the CPM schedule or any revised CPM schedule shows anything not jointly agreed upon, it shall be deemed to have not been accepted by the Owner and Architect. Failure to include any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase notwithstanding the Owner's and Architect's acceptance of the CPM schedule.

E. Progress Reporting, Updating and Revisions

1. On a date mutually agreed upon by the Architect/Owner and the Contractor, a job site progress meeting will be held each month at which time the CPM schedule will be reviewed and updated. Attendees of this meeting will include the Owner/Architect, the General Contractor and subcontractors if requested by the Owner and Architect. The Contractor shall have his copy of the Payment Request form and all other data required by the Contract Documents accurately filled in and completed prior to this meeting. Job progress and the CPM schedule will be reviewed to verify:

    a. Payment due to the Contractor based on percentage complete of items in the submitted Payment Request form.
    b. Logic, time and cost data for change order work that is to be incorporated into the CPM schedule or Payment Request form.
    c. Status of as-built record drawings and as-built record specifications.

2. The Contractor shall submit an oral and written report as part of his monthly progress review and update.

    a. Actual start and finish dates of activities completed during update period since the last accepted revision.
    b. Logic and duration revisions proposed.
    c. Explanation of all changes in logic or in the schedule work sequence, in durations, manpower and equipment.
    d. Any changes to the supporting data submitted with the original complete project schedule or with any subsequent revision.
    e. A description of critical path for the remainder of the project.
    f. A description of problem areas.
    g. Current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates.
    h. An explanation of corrective action taken or proposed.

3. Within 5 working days after each monthly update or revisions, the Contractor shall submit to the Owner/Architect 1 complete bluelines set and complete set of reproducible transparencies of the last accepted CPM schedule and diagram, each marked up in red showing all revisions and changes in accordance with the monthly review meeting.

4. Within 5 working days after receipt of notice from the Owner/Architect, the Contractor shall submit a reviewed CPM schedule for any of the following reasons.

a. When delay in completion of any activity or group activities indicates on overrun of the contract time or milestone requirement by 20 working days or 10 percent of the remaining duration, whichever is less.
b. Delays in submittals or deliveries or work stoppage are encountered which make replanning or rescheduling of the work necessary.
c. The schedule does not represent the actual prosecution and progress of the project as being performed in the field.

5. Acceptance of any reviewed CPM schedule and all supporting data is contingent upon compliance with all other paragraphs of this section and any other previous agreements or requirement with or by the Owner/Architect.

6. The cost of revisions to the CPM schedule resulting from Contract changes shall be included as part of General Administrative cost for the change in work.

7. The cost of revisions to the CPM schedule not resulting from authorized Contract changes shall be the responsibility of the Contractor.

F. Responsibility for Completion

1. The Contractor agrees that whenever it becomes apparent from the monthly progress review meeting or the current computer produced calendar-dated schedule that phasing or contract completion dates will not be met, he shall take some or all of the following action at no additional cost to the Owner:

a. Increase construction manpower in such quantities and crafts as will bring the progress of the work into conformance with all other requirements of this section.
b. Increase the number of working hours per shift, shifts per working day, work days per week, the amount of construction equipment or any combination of the foregoing, to bring the schedule and progress of the work into conformance with all requirements of the Contract Documents.
c. Reschedule the work under this Contract in conformance with all other Contract requirements to demonstrate completion of the Contract work within the contract time.

G. Adjustment of the Contract Time

1. The contract time will be adjusted only for causes specified in the Contract Documents. In the event the Contractor requests an adjustment of the Contract time, he shall furnish such justification, CPM data and supporting evidence as the Owner/Architect may deem necessary for a determination as to whether or not the Contractor is entitled to an adjustment of time under the provisions of the Contract. Submission of proof based on revised activity logic, durations and costs is obligatory with any request.

2. The Contractor shall submit each request for an adjustment in the Contract item to the Owner/Architect in accordance with all other requirements of the Contract Documents. The Contractor shall include, as part of each request:
a. Justification for the delay in narrative form.

b. A subnetwork showing all CPM logic revisions, duration changes, and cost changes, for the work in questions and its relationship to other activities on the CPM schedule.

3. The schedule must clearly display that the Contractor has used, in full all the float time available for the work involved in this request. Actual delays in activities which according to the computer produced calendar dated schedule, do not affect the critical path work in the CPM schedule, will not be the basis for an adjustment of the contract time.

4. The Owner/Architect's determination as to the adjustment of the Contract time shall be based upon the latest computer produced calendar dated schedule which has been accepted at the time of the alleged delay and all other relevant information. The Contractor shall submit with every request, an updated CPM schedule when the actual field progress of the work does not conform to the accepted computer produced calendar dated schedule in force at the time of the alleged delay. The CPM data if approved by the Architect shall be included in the next monthly updating of the schedule.

5. The Owner/Architect shall, within a reasonable time after receipt of a request for extension of the Contract time and supporting evidence, review the facts and shall advise the Contractor, in writing of this decision.

6. When the Owner/Architect has not yet made a final determination as to the adjustment of the Contract time, and the parties are unable to agree as to the amount of the adjustment to the reflected in the CPM schedule, the Contractors shall reflect that amount of time adjustment in the CPM schedule as the Owner/Architect may determine to be appropriate for interim purposes. It is understood and agreed that any such interim determination by the Owner/Architect is not binding and shall be made only for the purpose of continuing to schedule the work as to any adjustment of the Contract time. The Contractor shall revise the CPM schedule prepared thereafter in accordance with the final decision.

H. Color Schedule

1. Provided by Architect after all sample color submittals are received and products are approved for use on the project. Notify Architect of any critical items requiring color selection earlier than noted above.

1.10 CLEANING AND PROTECTION

A. During handling and installation of work, each Contractor shall clean and protect work and adjoining work. Apply protective covering on installed work where required to protect from damage or deterioration.

B. Clean and perform maintenance on work as necessary during the duration of construction. Adjust and lubricate operable components to ensure operability without damages.

END OF SECTION

SECTION 01 04 50

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

Requirements and limitations for cutting and patching of Work.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural work in a manner that would result in a reduction of load carrying capacity or of load deflection ratio. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

1. Foundation construction.
2. Structural concrete.
3. Stair systems.
4. Miscellaneous structural metals.
5. Exterior curtain wall construction.
6. Equipment supports.
7. Piping, ductwork, vessels and equipment.

B. Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, to increase maintenance, or to decrease operational life or safety.

C. Visual Requirements:

1. Do not cut and patch construction exposed on the exterior or in its occupied spaces, without consulting the architect.
2. Remove and replace Work cut and patched in a visually unsatisfactory manner.
3. If possible, retain the original installer or fabricator to cut and patch the exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.

1.04 SUBMITTALS

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate contractor.
6. Cost estimate and type of reimbursement review by Architect. Review does not waive Architect's right to later require complete removal and replacement of any part of work found to be unsatisfactory.

B. Include in Request:

1. Identification of Project.
2. Location and description of affected work.
3. Necessity for cutting or alteration.
4. Description of proposed work, entities to perform work, products to be used, dates when work is to be performed.
5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate contractor.
7. Written permission of affected separate contractor.
8. Describe anticipated results in terms of changes to existing construction.
9. List utilities to be disturbed or relocated or temporarily out of service. Indicate length of service disruption.
10. Where work involves addition of reinforcement to structural elements, submit details and engineering calculations showing how new reinforcement integrates with original structure.
11. Date and time work will be executed, to provide for Architects observation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution under provisions of General Conditions and Section 01600, "Substitutions".

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing work, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Provide temporary supports to ensure structural integrity of the work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work.

C. Maintain excavations free of water.

3.03 CUTTING AND PATCHING

A. Execute cutting, fitting, and patching including excavation and fill to complete work as required under pertinent other Sections of these Specifications.

B. Fit products together, to integrate with other work.

C. Uncover work to install work inadvertently forgotten previously.

D. Remove and replace defective or nonconforming work.

E. Remove samples of installed work for testing when requested.

F. Provide openings in the work for penetration of mechanical and electrical work.

3.04 PERFORMANCE

A. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing.

B. Employ original subcontractor to perform cutting and patching for weather exposed and moisture resistant elements.

C. Cut materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

D. Restore work with new products in accordance with requirements of Contract Documents.

E. Fit work tightly to pipes, sleeves, ducts, conduit, and other penetrations through surfaces, caulking where necessary to create water and air resistive barriers.

F. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07900, to full thickness of the penetrated element.

G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.05 PAYMENT FOR COSTS

Owner will reimburse Contractor, pursuant to a written Change Order, after claim for such reimbursement is submitted and approved by Owner for cutting and patching.

END OF SECTION

SECTION 01 09 00

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Quality assurance.
B. Schedule of references.
C. Specification Format.
D. Drawing Symbols.
E. Industry Standards.
F. Applicable Codes.
G. Conformance to Codes.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
B. Conform to reference standard by date of issue current on date of Contract Documents.
C. Obtain copies of standards when required by Contract Documents.
D. Maintain copy at job site during submittals, planning, and progress of the specific work, until Substantial Completion.
E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
F. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 SCHEDULE OF REFERENCES

A. The following list is for reference only and may include acronyms not necessarily referred to in these specifications.

AA: Aluminum Association
818 Connecticut Avenue, N.W
Washington, DC 20006

AASHTO: Associated Air Balance Council
1000 Vermont Avenue, N.W.
Washington, DC 20005

AASHTO: American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W.

Washington, DC 20001

ACI: American Concrete Institute
Box 19150
Reford Station
Detroit, MI 48219

ADC: Air Diffusion Council
230 North Michigan Avenue
Chicago, IL 60601

AGC: Associated General Contractors of America
1957 E Street, N.W.
Washington, DC 20006

AI: Asphalt Institute
Asphalt Institute Building
College Park, MD 20740

AIA: American Institute of Architects
1735 New York Avenue, N.W.
Washington, DC 20006

AISC: American Institute of Steel Construction
400 North Michigan Avenue, Eighth Floor
Chicago, IL 60611

AISI: American Iron and Steel Institute
1000 16th Street, N.W.
Washington, DC 20036

AITC: American Institute of Timber Construction
333 W. Hampden Avenue
Englewood, CO 80110

AMCA: Air Movement and Control Association
30 West University Drive
Arlington Heights, IL 60004

ANSI: American National Standards Institute
1430 Broadway
New York, NY 10018

APA: American Plywood Association
Box 11700
Tacoma, WA 98411

ARI: Air Conditioning and Refrigeration Institute

1501 Wilson Boulevard
Arlington, VA 22209

ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
1791 Tullie Circle, N.E.
Atlanta, GA 30329

ALSA American Society of Landscape Architects
4401 Connecticut N.W., 5th Floor
Washington, D.C. 20008-2302

ASME: American Society of Mechanical Engineers
345 East 47th Street
New York, NY 10017

ASPA: American Sod Producers Association
4415 West Harrison Street
Hillside, IL 60162

ASTM: American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103

AWI: Architectural Woodwork Institute
2310 South Walter Reed Drive
Arlington, VA 22206

AWPA: American Wood Preservers' Association
7735 Old Georgetown Road
Bethesda, MD 20014

AWS: American Welding Society
550 LeJeune Road, N.W.
Miami, FL 33135

AWWA: American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

BIA: Brick Institute of America
11490 Commerce Park Drive
Reston, VA 22091

CDA: Copper Development Association
57th Floor, Chrysler Building
405 Lexington Avenue
New York, NY 10174

CLFMI: Chain Link Fence Manufacturers Institute
1101 Connecticut Avenue, N.W.
Washington, DC 20036

CRSI: Concrete Reinforcing Steel Institute
933 Plum Grove Road
Schaumburg, IL 60195

DHI: Door and Hardware Institute
7711 Old Springhouse Road
McLean, VA 22102

EJCDC: Engineers' Joint Contract Documents Committee
American Consulting Engineers Council
1015 15th Street, N.W.
Washington, DC 20005

EJMA: Expansion Joint Manufacturers Association
25 North Broadway
Tarrytown, NY 10591

FGMA: Flat Glass Marketing Association
3310 Harrison
White Lakes Professional Building
Topeka, KS 66611

FM: Factory Mutual System
1151 Boston-Providence Turnpike
P.O. Box 688
Norwood, MA 02062

FS: Federal Specification General Services Administration
Specifications and Consumer Information Distribution Section (WFSIS)
Washington Navy Yard, Bldg. 197
Washington, DC 20407

GA: Gypsum Association
1603 Orrington Avenue
Evanston, IL 60201

ICBO: International Conference of Building Officials
5360 S. Workman Mill Road
Whittier, CA 90601

IEEE: Institute of Electrical and Electronics Engineers
345 East 47th Street
New York, NY 10017

IMIAC: International Masonry Industry All-Weather Council
International Masonry Institute
815 15th Street, N.W.
Washington, DC 20005

MBMA: Metal Building Manufacturer's Association
1230 Keith Building

Cleveland, OH 44115

MFMA: Maple Flooring Manufacturers Association
60 Rivere Drive
Northbrook, IL 60062

MIL: Military Specification
Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120

ML/SFA: Metal Lath/Steel Framing Association
221 North LaSalle Street
Chicago, IL 60601

NAAMM: National Association of Architectural Metal Manufacturers
221 North LaSalle Street
Chicago, IL 60601

NCMA: National Concrete Masonry Association
P.O. Box 781
Herndon, VA 22070

NEMA: National Electrical Manufacturers Association
2101 'L' Street, N.W.
Washington, DC 20037

NFPA: National Fire Protection Association
Battery March Park
Quincy, MA 02269

NFPA: National Forest Products Association
1619 Massachusetts Avenue, N.W.
Washington, DC 20036

NRCA National Roofing Contractors Association
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018

NSWMA: National Solid Wastes Management Association
1730 Rhode Island Ave., N.W.
Washington, DC 20036

NTMA: National Terrazzo and Mosaic Association
3166 Des Plaines Avenue
Des Plaines, IL 60018

NWMA: National Woodwork Manufacturers Association
205 W. Touhy Avenue
Park Ridge, IL 60068

PCA: Portland Cement Association

5420 Old Orchard Road
Skokie, IL 60077

PCI: Prestressed Concrete Institute
201 North Wells Street
Chicago, IL 60606

PS: Product Standard
U.S. Department of Commerce
Washington, DC 20203

RIS: Redwood Inspection Service
One Lombard Street
San Francisco, CA 94111

RCSHSB: Red Cedar Shingle and Handsplit Shake Bureau
515 116th Avenue
Bellevue, WA 98004

SDI: Steel Deck Institute
P.O. Box 9506
Canton, OH 44711

SDI: Steel Door Institute
712 Lakewood Center North
14600 Detroit Avenue
Cleveland, OH 44107

SIGMA: Sealed Insulating Glass Manufacturers Association
111 East Wacker Drive
Chicago, IL 60601

SJI: Steel Joist Institute
1205 48th Avenue North, Suite A
Myrtle Beach, SC 29577

SMACNA: Sheet Metal and Air Conditioning Contractors' National Association
8224 Old Court House Road
Vienna, VA 22180

SSPC: Steel Structures Painting Council
4400 Fifth Avenue
Pittsburgh, PA 15213

TCA: Tile Council of America, Inc.
Box 326
Princeton, NJ 08540

UL: Underwriters' Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062

WCLIB: West Coast Lumber Inspection Bureau
6980 S.W. Varns Road
Box 23145
Portland, OR 97223

WIC: Woodwork Institute of California
1833 Broadway
P.O. Box 11428
Fresno, CA 93773

WWPA: Western Wood Products Association
1500 Yeon Building
Portland, OR 97204

1.05 SPECIFICATION FORMAT AND CONTENT EXPLANATION:

This article is provided to help the user of these Specifications understand the format, language, implied requirements and similar conventions. None of the explanations shall be interpreted to modify the substance of contract requirements.

A. Specification Format: These specifications are organized into Divisions/or Sections based on the Construction Specifications Institute's 16-Division format and numbering system. This organization conforms generally to recognized construction industry practice.

B. Specification Format: This Specification has been produced employing conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Language used in Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and where the full context of the Contract Documents so indicates.
2. Imperative Language is used generally in the Specifications. Requirements expressed imperatively are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities which must be fulfilled indirectly by the Contractor, or by others when so noted.

C. Assignment of Specialists: The Specification requires that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists should be engaged for those activities, and the assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

1. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
2. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

1.06 DRAWING SYMBOLS

A. Graphic symbols used on the Drawings are those recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., seventh edition.

B. Mechanical/Electrical Drawings: Graphic symbols used on Mechanical and Electrical Drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, they are supplemented by more specific symbols as recommended by technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect for clarification before proceeding.

1.07 INDUSTRY STANDARDS

A. Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.
   1. Referenced standards take precedence over standards that are not referenced but recognized in the construction industry as applicable.
   2. Unreferenced Standards: Except as otherwise limited by the Contract Documents, standards not referenced but recognized in the industry as applicable will be enforced for performance of the Work. The Architect will decide whether a code or standard is applicable, or which of several are applicable.

B. Publication Dates: Where compliance with an industry standard is required, comply with standard in effect as of date of Contract Documents.
   1. Updated Standards: At the request of the Architect, Contractor or authority having jurisdiction, submit a Change Order proposal where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of the Work affected. The Architect will decide whether to issue a Change Order to proceed with the updated standard.

C. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown specified shall be the least quantity or quality provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum with reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to the Architect for decision before proceeding.

D. Copies of Standards: Each entity engaged in construction of the Project is required to be familiar with industry standards applicable to that entities' construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed for proper performance of a required construction activity, the Contractor shall obtain copies directly from the publication source. Although copies of standards needed for enforcement of requirements may be part of required submittals, the Architect reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

E. Abbreviations and Names: Where acronyms or abbreviations are used in specifications or other Contract Documents they are defined to mean the industry recognized name of trade association, standards generating organization, governing authority, the Standard Abbreviations for use on Drawings and Text ANSI Z.10.1 or other entity applicable to context of text provision. Refer to "Encyclopedia of Associations", published by Gale Research Company available in large libraries, and "Schedule of References" of this Section.

1.08 APPLICABLE CODES AND STANDARDS

A. The work to be performed and the materials and equipment furnished under these Contract Documents shall be in strict conformity in every respect with applicable portions of the latest editions of the following governing codes, rules or regulations, or standards as most recently amended or supplemented:

STATE OF CALIFORNIA ADMINISTRATIVE CODE (IN PARTICULAR APPLICABLE PORTIONS OF):

Title 1: Chapter 7 (Access by handicapped persons)
Title 8: Industrial Relations
Title 17: Public Health
Title 19: Public Safety
Title 21: Public Works
Title 24: Building Standards

NATIONAL FIRE PROTECTION ASSOCIATION - NATIONAL FIRE CODES LATEST EDITION (IN PARTICULAR, APPLICABLE PORTIONS OF):

Volume 2: Gases
Volume 4: Building Construction and Facilities
Volume 5: Electrical
Volume 7: Alarm Systems
Volume 8: Portable and Manual Fire Control Equipment
Volume 9: Occupancy Standards and Process Hazards

CALIFORNIA BUILDING CODE (2007 Edition)
Latest editions of:
UNIFORM FIRE CODE
UNIFORM MECHANICAL CODE
UNIFORM PLUMBING CODE
NATIONAL ELECTRIC CODE
AMERICAN NATIONAL STANDARDS INSTITUTE
Standards for making buildings and facilities accessible to and usable by physically handicapped.

NATIONAL FIRE PROTECTION ASSOCIATION

CALIFORNIA ENERGY CONSERVATION STANDARDS FOR NEW NONRESIDENTIAL BUILDING
STANDARD SPECIFICATIONS, STATE OF CALIFORNIA, DIVISION OF TRANSPORTATION, CAL TRANS (Latest Edition)

STATE FIRE MARSHALL LISTING SERVICE (Including all latest supplements)
Building Construction Materials List
Listed Construction Materials and Equipment List
Electrical
Fire Protection
Construction Materials and Equipment List, Heating and Ventilating
Gas and Oil

COUNTY OF KERN:

1. Health Department
2. Environmental Health Department

1.09 CONFORMANCE TO CODES AND STANDARDS

A. Nothing in these plans or specifications is to be construed to permit work not conforming to these codes and standards. Where in conflict the requirements of the above mentioned codes and standards take precedence over the Contract Documents.

B. If the Contractor or any Subcontractor or bidder notices any conflict between the above mentioned codes and standards and the Contract Documents, immediately notify the Architect who will resolve the conflict by addendum.

C. If the Contractor performs work knowing it to be contrary to laws, statutes, ordinances, building codes and rules and regulations without notice to the Architect and Owner, the Contractor shall assume full responsibility for such work and shall bear the attributable costs.

D. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without notifying the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

END OF SECTION

SECTION 01 18 00

UTILITIES

DIVISION 00 & 01 ARE A PART OF THIS SECTION

PART 1 GENERAL

a. Permanent utilities shall be stubbed out to the building face for connection by the District.

b. Construction Utilities: The General Conditions and Supplemental General Conditions and Section 10 are a part of this Section.

PART 2 PRODUCTS

a. All water used on this Work will be furnished and paid for by the Contractor. The Contractor shall furnish and install the necessary temporary piping from the distribution points of the site where water is necessary to carry on the work and, upon completion of the work, shall remove all temporary piping.

b. Electricity: The Contractor shall make all necessary arrangements to include application to serving utility companies for all temporary and permanent electric services and the District will pay all application fees. Contractor shall pay all other costs.

1) Adequate artificial lighting shall be provided at all points within the structure where natural light is insufficient to read the drawings and specifications and for the proper performance of or inspection of the work.

PART 3 EXECUTION

a. All temporary utility services required for construction of the work shall be furnished by and at the expense of the Contractor except as noted above. The Contractor shall make all temporary and/or permanent connections thereto as called for in this Contract or incidental thereto in his operation. All utilities, sewers and other underground obstructions encountered during the work shall be relocated, removed, capped, or otherwise disposed of in a manner approved by the utility company involved and as directed, or approved by the Architect.

b. Building Placement: Buildings shall be placed row style on sites and shall be spaced between 12" and 24" apart unless noted otherwise. The contractor will be responsible for installing wall closers between each building. Closers shall be made of matching siding material (M.D.O.) and shall be painted to match building.

END OF SECTION

SECTION 01 26 73 – DSA CONSTRUCTION CHANGE DOCUMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing DSA Construction Change Documents for modifications of portions of the project affecting the Structural Safety, Access Compliance, and Fire and Life Safety.

B. Related Sections:
1. Division 01 Section Contract Modification Procedures for administrative procedures for handling contract modifications not affecting the Structural Safety, Access Compliance, and Fire and Life Safety portions of the project.

1.02 DEFINITIONS

A. DSA: Division of the State Architect.

1.03 CONSTRUCTION CHANGE DOCUMENT

A. Construction Change Document: Architect will submit a Construction Change Document on DSA Form 140 Application for Approval of Construction Change Document to DSA. Upon DSA approval of a Construction Change Document, Architect will notify Contractor to proceed with the change in the Work, for subsequent inclusion in a Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 30 00

SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures
B. Construction progress schedules
C. Proposed products list
D. Shop drawings
E. Product data
F. Samples
G. Manufacturers' instructions
H. Manufacturers' certificates
I. Approval by the Division of the State Architect
J. Delays
K. Work not included
L. Review of submittals
M. Shop Drawing Review Stamp
N. Submittal Requirements

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 SUBMITTAL PROCEDURES

A. Prior to each submittal, carefully review and verify each item and the submittal for it to conform in all aspects with the specified requirements.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate. Provide submittal description / purposes.

D. The CONTRACTOR is to prioritize his submittals in order as needed. The CONTRACTOR under-stands that the ARCHITECT will respond to the submittals based upon the order submitted by the CONTRACTOR. Should a timing problem arise, the most needed submittals per the CONTRACTOR'S schedule will be reviewed first.

E. The submittals will be shown on the Preliminary Schedule as well as the regular construction progress schedule. Failure to list the as needed order of the

submittals, on the schedules, will result in the ARCHITECT processing the submittals in the order in which they are presented and logged in by the ARCHITECT.

F. Provide Contractor's certificate as part of each submittal with stamp. Cover sheet shall accompany each submittal as required by Supplementary Conditions. See enclosed certificate at end of this Section.

G. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with requirements of the work and Contract Documents.

H. Deliver to the address of the Owner as designated by the Project Manager for the Kern High School District. Coordinate submission of related items. Architect shall have a minimum of 21 calendar days for initial review of all submittals. Contractor shall submit entire submittals for each Section of Specifications per the enclosed submittal requirements at the end of this Section at one time. Failure to adhere to this requirement will result in an additional submittal review charge of $500.00 per item required to be submitted for that Section. This charge is payable prior to Architects review. Payment of this additional charge will initiate the 21-day review period.

I. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed work, by indicating on the Product Data information in yellow marking pen.

J. Provide a space 4-inch x 4-inch for Contractor and Architect review stamps.

K. Revise and resubmit submittals as required, identify all changes made since previous submittal in letter form. Allow 14 calendar days following the date of receipt for reprocessing time by the Architect.

L. Distribute copies of reviewed submittals to subcontractors. Instruct subcontractors to promptly report any inability to comply with provisions.

M. Maintain an accurate submittal log showing current status of all submittals available to Architect review upon request.

N. Once a submittal has been reviewed, those parts that have been rejected are always rejected and must be corrected and resubmitted. Resubmittal and acceptance does not constitute acceptance of any previously rejected item(s) of a submittal.

1.04 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within 10 days after execution of the Contract for Architect review. Within 20 days after receipt of Notice to Proceed, submit the complete CPM Schedule.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Refer to Specification Section 1040 “Schedules " for format of progress schedule.

E. Indicate estimated percentage of completion for each item of work at each Application for Payment Submission.

F. All submittals required shall be submitted within 35 days unless noted otherwise or as shown on drawing from date of Notice To Proceed for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and those under allowances.

1.05 PROPOSED PRODUCTS LIST

A. Within 35 days after date of Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product, by Specification section number and Subcontractor.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

C. Provide a proposed list of substitutions per Public Contracts code section. 3400 and Article 19 of the General Conditions. Each proposed substitution must be submitted separately and clearly marked “Substitution Request “.

1.06 SHOP DRAWINGS

A. Defined as drawings, diagrams, schedules, and other data specially prepared for this work to illustrate some portion of the work. Not Contract Documents.

B. Submit in the form of one hard copy and one reproducible transparency, indicating Specification Section and location of work which will be returned with appropriate comments.

C. Installation layouts required due to tight field conditions shall be prepared by Contractor in the form of plans or elevations as necessary.

D. After review distribute in accordance with this Section and for Record Documents described in Section 01700 - Contract Close-Out.

1.07 PRODUCT DATA

A. Defined as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information illustrating materials or equipment for some portion of the work. Not contract documents.

B. Submit the number of copies, which the Contractor requires, plus (3) copies, which will be retained by the Architect.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

D. After review, distribute in accordance with this Section and provide copies for Record Documents described in Section 01700 - Contract Close-Out.

1.08 SAMPLES

A. Defined as physical examples illustrating material, equipment, or workmanship, which establish standards by which the work will be judged. Not Contract Documents. Should physical samples be necessary, as judged by the ARCHITECT, those samples will be large enough to demonstrate the product being shown as to color, workmanship tooling, texture, etc...

B. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

C. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect's selection.

D. Include identification on each sample, with Project Title, Specification Section and product identification.

E. Submit the number of samples specified in individual Specification Sections plus (2) which will be retained by Architect. Maintain one set of samples at project site for comparison to installed products. Deliver set of samples to Architect upon completion of the work.

F. Reviewed the samples which may be used in the work are indicated in individual Specification Sections.

1.09 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual Specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' written instructions and the Contract Documents, by indicating with yellow marking pen.

1.10 MANUFACTURER'S CERTIFICATES

A. When specified in individual Specification Sections, submit manufacturers' certificate to Architect for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product but must be acceptable to Architect.

1.11 APPROVAL BY THE DIVISION OF THE STATE ARCHITECT

A. For literature which requires D.S.A. approval, submit one additional copy of required documentation.

B. Make submittals requiring D.S.A. approval at the earliest possible date. The OWNER and ARCHITECT have no control over D.S.A. review time.

1.12 DELAYS

Costs of delays occasioned by the CONTRACTOR'S failure to provide submittal information within the required specified limits after issuance of the Notice to Proceed shall be borne by the CONTRACTOR. Failure to provide a complete submittal package within the required time period after the issuance of the Notice to Proceed will ***not*** be considered as a cause for granting time extensions on material substitutions.

1.13 WORK NOT INCLUDED

A. Submittals not specifically required by the Contract Documents will not be reviewed by the Architect.

B. Drawings, setting diagrams, and similar information required by the Contractor of its Subcontractors for coordination purposes will not be reviewed by the Architect.

1.14 REVIEW OF SUBMITTALS

A. Architect's Review: Where required, Architect will review each submittal, mark with Shop Drawing Review Stamp and return copies of submittal to Contractor. Where submittal must be held for coordination, Contractor will be promptly advised of the delay and everything possible will be done to hold the delay to a minimum.

B. Conditions of Review:

1. Architect's review is for general conformance with the design concept and Contract Documents. Review action on a submittal by the Architect does not in any way constitute a change order. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy, for conforming and correlating all quantities and dimensions, for selecting fabrication processes for techniques of assembly, and for performing its work in a safe manner.

2. The Contractor is responsible for coordinating its work with and between that of all subcontractors and trades.

3. Absolutely no deviation from the Contract Documents will be permitted without written notification from the Contractor that the submittal contains deviations.

4. The Architect's review is not the final stage of acceptance for any part of the project, nor does it relieve the Contractor of its Contractual responsibilities.

1.15 SHOP DRAWING REVIEW STAMP

The Architect's review stamp has indications for the following conditions:

A. No Exceptions Taken: If this box is marked, the work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents; acceptance of the work will depend upon that compliance.

B. Make Corrections Noted: If this box is marked, the work covered by the submittal may proceed provided it complies with both the Architect's notations or corrections to the submittal and with the requirements of the Contract Documents; acceptance of the work will depend on that compliance.

C. Revise and Resubmit: If this box is marked, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal in accordance with the Architect's notations and resubmit without delay. Repeat if necessary. Refer to Submittal Procedures of this Section for review time to be allowed.

D. Rejected: If this box is marked, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in accordance with the Architect's notations and resubmit without delay.

1.16 SUBMITTAL REQUIREMENTS

A. Submittal Schedule: Submit to the Architect, within 15 calendar days of Contract signing date, a comprehensive submittal schedule which includes the latest dates that each submittal item(s) required by the Contract Documents will be submitted.

B. Submittals required by the Contract Documents include, but are not necessarily limited to:

SECTION:	DESCRIPTION:	REQUIREMENTS:
01 02 70	APPLICATION FOR PAYMENT	- SCHEDULE OF VALUES
01 02 80	CHANGE ORDER PROCEDURES	- CONTRACTOR'S AUTHORIZED INDIVIDUAL TO RECEIVE CHANGE DOCUMENTS
01 04 00	COORDINATION AND MEETINGS	- LAND SURVEYOR CERTIFIED SITE GRADING PLAN INDICATING CONFORMANCE TO CONTRACT DOCUMENTS SITE GRADING PLAN - PRECONSTRUCTION CONFERENCE SUBMITTALS - WEEKLY PROGRESS MEETING NOTES AND ADDITIONAL INFORMATION - PREINSTALLATION CONFERENCE SUBMITTALS - PRELIMINARY AND FINAL PROGRESS SCHEDULES
01 04 50	CUTTING AND PATCHING	- CUTTING AND PATCHING REQUESTS
01 30 00	SUBMITTALS	- REVISED CONSTRUCTION PROGRESS SCHEDULE WITH EACH PAYMENT REQUEST - LIST OF MAJOR PRODUCTS PROPOSED WITHIN 60 DAYS AFTER NOTICE TO PROCEED - LIST OF SUBSTITUTIONS PROPOSED WITHIN 60 DAYS AFTER NOTICE TO PROCEED
01 40 00	QUALITY CONTROL	- MANUFACTURER'S OR SUPPLIER'S OBSERVER QUALIFICATIONS AND OBSERVER REPORT (SEE INDIVIDUAL SECTIONS)

		- LICENSED CIVIL ENGINEER CERTIFIED TEST REPORTS - VERIFIED REPORT FORMS (SSS-6) - AFFIDAVITS, CERTIFICATES, REPORTS PER D.S.A. - AIR BALANCE TESTING AGENCY CREDENTIALS
01 75 00	STARTING AND ADJUSTING	- WRITTEN REPORT FOR SYSTEMS INSTALLATION AND FUNCTIONING

01 77 00	CONTRACT CLOSE-OUT	- WORK COMPLETION CERTIFICATION
		- FINAL APPLICATION FOR PAYMENT AND ADDITIONAL DOCUMENTS:
		  - RECORD DRAWINGS
		  - OPERATION AND MAINTENANCE DATA
		  - WARRANTIES
		  - SPARE PARTS
		  - KEYS AND KEYING SCHEDULE
		  - GOVERNMENTAL JURISDICTION APPROVALS
		  - CERTIFICATES OF INSURANCE
		  - LIEN RELEASES
		  - SUBCONTRACTOR LIST
		  - FINAL VERIFIED REPORT TO D.S.A.

05 12 00	STRUCTURAL STEEL AND MISCELLANEOUS IRON	- SHOP DRAWINGS - TEST REPORTS
05 52 13	PIPE AND TUBE RAILINGS	- PRODUCT DATA - SHOP DRAWINGS - TEST REPORTS - SAMPLES

06 10 00	CARPENTRY	- PRODUCT DATA - WOOD TREATMENT DATA - UNDERLAYMENT DATA
09 90 00	PAINTING	- COLOR SAMPLES - SCHEDULES - MATERIALS LIST - EXTRA STOCK - GUARANTEE
10 14 26	POST AND PANEL/PYLON SIGNAGE	- PRODUCT DATA - SHOP DRAWINGS - INSTALLATION INSTRUCTIONS - COLOR SAMPLES
10 14 19	SIGNS	- PRODUCT DATA - SHOP DRAWINGS - INSTALLATION INSTRUCTIONS - COLOR SAMPLES
26 00 00	ELECTRICAL SCOPE AND GENERAL REQUIREMENTS	-LIST OF MATERIALS - SUBSTITUTIONS LIST - SHOP DRAWINGS
27 00 00	COMMUNICATIONS	- SHOP DRAWINGS
28 16 00	INTRUSION DETECTION	- COMPLETE SUBMISSION MANUAL - OPERATION AND SERVICE MANUAL
28 31 00	FIRE DETECTION AND ALARM	- CATALOG CUT SHEETS - SHOP DRAWINGS - OPERATION AND MAINTENANCE MANUAL - D.S.A. APPROVAL
32 12 16	ASPHALTIC CONCRETE PAVING	- CERTIFICATE OF MIX DESIGN - MANUFACTURER'S INSTRUCTIONS

		- BASE COMPACTION TEST REPORTS - MATERIAL CERTIFICATES
31 20 00	EARTHWORK	- TEST REPORTS - BUILDING PAD CERTIFICATIONS
32 31 13	CHAIN LINK FENCES AND GATES	- SHOP DRAWINGS - PRODUCT DATA - INSTALLATION INSTRUCTIONS - SAMPLES

END OF SECTION

SECTION 01 40 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Related documents.

B. Owners Inspector.

C. Related work.

D. References.

E. Samples.

F. Mock-up.

G. Selection of testing laboratory.

H. Payment for testing services.

I. Contractor's convenience testing.

J. Code compliance testing.

K. Quality assurance/control of installation.

L. Manufacturers' field services and reports.

M. Submittals.

N. Air balance Contractor.

O. Tests and Inspections.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 OWNER’S INSPECTOR

A. An DSA - Certified Inspector shall be employed by the Owner as its representative in accordance with the requirements of the State of California Code of Regulations Title 24 Part 1 whose duties are specifically defined in Section 4-341 and 4-342 of Title 24.

B. Assist the Inspector's primary duty of continuously inspecting every part of the Contractors work for compliance to Contract Documents and to communicate with and give any instructions to the Contractor's Superintendents by providing personal access and facilities for access to all the work at all times and by providing a field office in accordance with "Construction Facilities" portion of Section 01500 of these Specifications.

C. The Inspector shall notify the Contractor, in writing, of any deviations from the approved contract documents which are not immediately corrected by the Contractor when brought to its attention

D. In case of dispute between the Contractor and the Inspector as to materials furnished or the manner of performing the work, the Inspector shall have authority to reject materials or to suspend work under direction from the District until the dispute at issue can be referred or settled.

E. The Inspector is not authorized to change, revoke, alter, enlarge or decrease in any way any requirement of the Contract Documents, nor to issue directives contrary to the Contract Documents.

F. Inspection of the work or failure to notify the Contractor of deviations from approved contract documents shall not relieve the Contractor from any obligation to fulfill the Contract, nor does the presence of the Inspector change, mitigate or alleviate the responsibility of the Contractor. Inspection of the work, by the Owner’s Inspector, doesn’t constitute acceptance by the DISTRICT or the ARCHITECT. Review and acceptance by both the DISTRICT and the ARCHITECT is required before the work can be deemed accepted.

G. Inspection of the work by the INSPECTOR does not constitute acceptance by the DISTRICT or the ARCHITECT. Review and acceptance by both the DISTRICT and the ARCHITECT is required before the work can be deemed accepted.

1.04 RELATED WORK

A. Requirements for testing may be described in various Sections of these Specifications.

B. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.

1.05 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents.

B. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 SAMPLES

A. Take field samples at the site as required by individual Specifications Sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect.

D. Report samples taken but not tested and special sampling operations as required.

1.07 MOCK-UP

A. Tests will be performed under provisions identified in this section.

B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Architect.

1.08 SELECTION OF TESTING LABORATORY

A. The Owner will select and pay a prequalified independent testing laboratory, approved by DSA, to conduct the tests.

B. Qualification of Laboratory

1. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

2. Meet basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

3. Authorized to operate in the State of California.

4. Testing Equipment: Calibrated at reasonable intervals by devices of accuracy traceable to either:

a. National Bureau of Standards

b. Acceptable values of natural physical constants.

C. Laboratory Duties:

1. Cooperate with Architect and Contractor; provide qualified personnel after due notice.

2. Perform specified inspections, sampling and testing of materials and methods of construction:

a. Comply with specified standards.

b. Ascertain compliance of materials with requirements of Construction Documents.

3. Promptly notify Architect and Contractor of observed irregularities or deficiencies of work or products.

4. Perform additional tests as required by Architect.

D. Limitations of authority of testing laboratory

1. Laboratory is not authorized to:

a. Release, revoke, alter or enlarge on requirements of Contract Documents.

b. Approve or accept any portion of Work.

c. Perform any duties of Contractor.

1.09 PAYMENT FOR TESTING SERVICES

A. Initial Services: Except where specifically indicated to the contrary in these Specifications, the Owner will pay for all initial testing services. Any additional cost for overtime testing work or for performing field tests in lieu of mill tests for the convenience of the Contractor, will be paid by the Owner and deducted from the Contract Sum.

B. Retesting: When initial tests indicate noncompliance with the Contract Documents, the initial test associated with that noncompliance and all subsequent retesting occasioned by the noncompliance shall be performed by the same testing laboratory and the costs thereof will be deducted by the Owner from the Contract Sum.

C. All testing must be authorized in writing by the Owner's Inspector.

D. Unnecessary tests and inspections costs due to Contractor's poor scheduling will be deducted by the Owner from the Contract Sum.

E. The Owner and Architect reserve the right to demand for tests, or special examination, any material, item or workmanship or part thereof to assure compliance with specifications and may reject for satisfactory replacement any material, work or part judged defective or nonconforming as a result thereof. If such tests or examinations indicate the work does not comply, then the cost of these tests and examinations shall be paid by the Contractor.

1.10 CONTRACTOR'S CONVENIENCE TESTING

Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.11 CODE COMPLIANCE TESTING

Inspections and tests required by codes or ordinances, or by the D.S.A., and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Owner, unless otherwise provided in the Contract Documents.

1.12 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

G. Cooperate with independent testing laboratory; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

1. Notify Architect and independent testing laboratory 72 hours prior to expected time for operations requiring services.

2. Make arrangements with independent testing laboratory and pay for additional samples and tests required for Contractor's use.

1.13 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual Specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of manufacturers' observer to Architect 30 days in advance of required observations. Observer subject to approval of Architect and Owner.

C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report in duplicate within 30 days of observation to Architect for review.

1.14 SUBMITTALS

A. Furnish copies of licensed Civil Engineer signed test reports to Architect, Contractor, D.S.A. and Owner's Inspector, indicating sampling and testing in accordance with Title 24 and stipulating whether results comply or do not comply with Contract Documents, noting actual results compared

to specified design strength. A copy of the D.S.A. Structural Tests and Inspections Form 411-11 and Documents Required form is enclosed.

B. Each testing agency shall submit to the Department of the State Architect a verified report in duplicate covering all tests required by that agency during the project. Report each time work is suspended, covering tests up to that time, and at the completion of the project, covering all tests.

C. Test Report Content:

1. Date of issue.
2. Project title and number.
3. Name, address and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making the inspection or test.
6. Designation of the Work and test method.
7. Identification of product and Specification Section.
8. Complete inspection or test data.
9. Test results and an interpretations of test results.
10. Ambient conditions at the time of sample taking and testing.
11. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements and the requirements CCR.T24.
12. Name and signature of laboratory Inspector.
13. Recommendations on retesting.

D. Provide completed Verified Report forms (SSS-6) as required by Title 24, Part 1, Section 4-336, plus one copy each to the project Owner's Inspector and Architect.

E. Provide affidavits, certificates and reports indicated by the DSA documents required forms found at the end of this Section for both Portions 1 and 2.

1.15 AIR BALANCE CONTRACTOR

A. An air balance testing agency acceptable to the Architect on this project shall be hired by the Contractor to conduct air balance testing on the completed Work of the Contractor. Provide information to the Architect for his review concerning air balance testing agency credentials.

B. HVAC subcontractor on this project shall not perform or select the Air Balancing testing Contractor or be associated financially with Air Balance Contractor.

1.16 TEST AND INSPECTIONS

A. Provide all tests and inspections required by government agencies having jurisdiction, required by provisions of the Contract Documents, and such other tests and inspections as are directed by the Architect.

B. Reports: Shall be executed immediately upon conclusion of each procedure and forwarded to:

Architect	Structural Engineer	Governing Agency
Contractor	Owner	
Sub-Contractor	Job Inspector	

C. All testing and inspection shall be in accordance with the latest adopted edition of the C.B.C. Title 21 or 22 & Title 24. Tests include, but are not necessarily limited to, those described in detail in Section 1.17.

1.17 TESTING AND INSPECTION FOR THE FOLLOWING ARE REQUIRED

A. MASONRY - STATE CHAPTER 21A

1. MATERIALS

a. Masonry Units	-	2103A.1
b. Portland Cement	-	2103A
c. Mortar & Grout Aggregates	-	2103A.8, 2103A.12, 2103A12.3
d. Reinforcing Bars	-	2103A.13.1

2. MASONRY QUALITY

a. Portland Cement Tests	-	1916A.1
b. Mortar & Grout Test	-	2105A.5
c. Masonry Prism Tests	-	2105A.2.2.2
d. Masonry Core Tests	-	2105A.4
e. Masonry Unit Tests	-	2105.A2.2.1
f. Reinforcing Bar Tests	-	1916A.2

3. MASONRY INSPECTION

a. Reinforced Masonry - 1704A.5

b. Reinforcing Bar Welding Inspection - 1704A.4.2

B. WOOD - STATE CHAPTER 23

1. MATERIALS

a. Lumber & Plywood Grading - 2303.1

b. Glued - Laminated Members - 2303.1.3

2. WOOD INSPECTION

a. Glue - Laminated Fabrication - 1704A.6.2.1, 2303.1.3

b. Timber Connectors - 1704A.6.3

c. Manufactured Trusses - 1704A.6.2.2, 2303.4.3

C. CONCRETE - STATE CHAPTER 19A

1. MATERIALS

a. Portland Cement Tests - 1704A.4.1, 1916A.1

b. Concrete Aggregates - 1704A.4.1, 1903A.3

c. Shotcrete Aggregates - - 1913A.3

d. Reinforcing Bars - 1704A.4.1, 1916A.2

e. Prestressing Steel & Anchorage - 1704A.4.1, 1916A.3

f. Batch Plant Inspection - 1704A.4.3

g. Waiver of Batch Plant Inspection & Tests - 1704A.4.4

2. CONCRETE QUALITY

a. Proportions of Concrete - 1904, A.2, A.3, A.4

b. Strength Tests of Concrete - 1905A.1.1, 1905A.6

c. Splitting Tensile Tests - 1905A.1.1, 1905A.6

d. Shotcrete Cores - 1913A.2

e. Composite Construction - 1913A.5

f. Gypsum Concrete Strength Tests - 1914A.1, 1916A.7

g. Insulating Concrete Tests - D.S.A. IR 27-1

h. Shotcrete Proportion - 1924A.2, A.3

3. CONCRETE INSPECTION

a. Job Site Inspection - 1905A.7

b. Batch Plant or Weighmaster Inspection - 1704A.4.3

c. Prestressed Concrete Inspection - 1704A.4.5

d. Shotcrete Inspection - 1913A.6, 1913A.7, 1913A.8, 1704A.15

e. Reinforcing Bar Welding Inspection - 1903A.4, 1704A.4.2

D. STEEL - STATE CHAPTER 22A

1. MATERIALS

a. Structural Steel, Cold - 2205A.1, 2209A.1

b. Material Identification - 2203A.1

2. INSPECTION AND TESTS OF STRUCTURAL STEEL

a. Tests of Structural & Cold Formed Steel - 2212A.1

b. Tests of High Strength Bolts, Nuts, Washers - 2212A.2

c.	Tests of End Welded Studs	-	2212A.3
d.	Shop Fabrication	-	1704A.3.2
e.	Welding Inspection	-	1704A.3.1
f.	Nelson Stud Welding	-	1704A3.1.1
g.	High Strength Bolt Inspection	-	1704A.3.3
h.	Steel Joist Load Tests	-	1704A.3.2.2, 2206A
i.	Non-Destructive Weld Testing	-	1704A.3.1

E. ALUMINUM - STATE CHAPTER 20A

1. MATERIALS

a.	Alloys	-	2002.1
b.	Identification	-	2002.1

F. EXCAVATIONS, FOUNDATIONS & RETAINING WALLS - STATE CHAPTER 18A

1. EARTH FILL COMPACTION - 1803A.5

2. INSPECTION

a.	Inspection of Driven Pile Installation	-	1704A.8
b.	Inspection of Caissons	-	1704A.9
c.	Excavation & Fill for Foundation	-	1803A

G. EXTERIOR WALL COVERINGS - STATE CHAPTER 14A

1. MATERIALS

a.	Masonry Units	-	1404.4, 1405.3.2
b.	Precast Concrete Units	-	Chapter 14

c. Mortar & Grout - 1405.9

2. INSPECTION

a. Veneer Inspection - 1408.3, 1704A.5.1

H. ROOF CONSTRUCTION AND COVERING - CHAPTER 15

1. MATERIALS

a. Roof Tile Test - 1507.7, D.S.A. IR 32-2

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSPECTION

A. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. The Inspector shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep the Inspector fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the Work shall not relieve the Contractor from any obligations to fulfill this Contract. Nor shall inspection of the work constitute acceptance until the ARCHITECT and the DISTRICT reviewed the work.

3.02 TESTING

A. Cooperation with Testing Laboratory: Representatives of the Testing Laboratory shall have access to the Work at all times. Provide facilities for such access in order that the laboratory may properly perform its functions.

B. Schedules for Testing

1. Establishing schedule

a. By advance discussion with the Testing Laboratory selected by the District, determine the time required for the laboratory to perform its tests and to issue each of its findings.

b. Provide all required time within the construction schedule.

2. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the Testing Laboratory as required. Immediately inform the DISTRICT and the ARCHITECT of such schedule changes in writing.

3. Adherence to Schedule: When the Testing Laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness

of the Work, all extra costs for testing attributable to the delay will be deducted by the Owner from the Contract Sum.

C. Taking Specimens: All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the Testing Laboratory or the Owner's Representative. All samples taken shall be witnessed by the Inspector as the samples are being taken.

D. Testing at the Source of Supply

1. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by Contractor under the Contract Documents, which must by terms of the Contract be tested, in order that the Owner may arrange for the testing of same at the source of supply.

2. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required shall not be incorporated in the job.

3.03 SOIL INSPECTING AND TESTING

A. Make required inspections and test include, but are not necessarily limited to:

1. Visually inspect on-site and imported fill and backfill, making such tests and retests as are necessary to determine compliance with the Contract requirements and suitability for the proposed purpose;
2. Make field density tests on samples from in-place material as required;

3. As pertinent, inspect and test the scarifying and recompacting of cleaned subgrade; inspect the progress of excavating, filling, and grading; make density tests at fills and backfills; and verify compliance with provisions of the Contract Documents and governmental agencies having jurisdiction.

B. Make and distribute necessary reports and certificates.

3.04 CONCRETE INSPECTING AND TESTING

A. Portland cement:

1. Secure from the cement manufacturer Certificates of Compliance delivered directly to the testing laboratory.

2. Require the Certificates of Compliance to positively identify the cement as to production lot, bin or silo number, dating and routing of shipment, and compliance with the specified standards.

3. If so required by the Architect, promptly provide such other specific physical and chemical data as requested.

B. Aggregate:

1. Provide one test unless character of material changes, material is substituted, or additional test is requested by the Architect.

2. Sample from conveyor belts or batching gates at the ready-mix plant:

   a. Sieve analysis to determine compliance with specified standards and grading.

   b. Specific gravity test for compliance with specified standards.

C. Laboratory design mix:

1. After approval of aggregate, and whenever character or source of materials is changed, provide mix design in accordance with ACI 613.

2. Provide designs for all mixes prepared by a licensed civil engineer.

D. Molded concrete cylinders:

1. Provide 3 test cylinders for each 50 cu yds, or fraction thereof, of each class of concrete of each days placement.

2. Test 1 cylinder at 7 days, 1 at 28 days, and 1 when so directed.

3. Report the mix, slump, gage, location of concrete in the structure, and test results.

4. Take specimens and make tests in accordance with the applicable ASTM standard specifications. Mark each test cylinder with identifying numbers or letters and note on the construction drawings the specific location where those cylinders were taken.

E. Core Tests:

1. Provide only when specifically so directed by the Architect because of low cylinder test results, per Section 2-2604, (d), Title 24.

2. Cut from locations directed by the Architect, securing in accordance with ASTM C42, and prepare and test in accordance with ASTM C39.

F. Placement Inspections:

1. On concrete over 2000 psi, provide continuous or other inspection as required by governmental agencies having jurisdiction.

2. Throughout progress of concrete placement, make slump tests to verify conformance with specified slump.

3. Using all required personnel and equipment, throughout progress of concrete placement verify that finished concrete surfaces will have the level or slope that is required by the Contract Documents.

4. No concrete will be allowed to be placed on the job without proper documentation from the batch plant accompanying the truck driver.

3.05 CONCRETE REINFORCEMENT INSPECTING AND TESTING

A. Identified Steel.

1. Identified steel shall be tagged and bundled by the supplier and accompanied by mill test reports. The tag shall identify the heat number for each bundle of steel. The testing laboratory must certify all identified steel.

2. Have the testing laboratory select samples consisting of two pieces, each 18 in. long, of each size.

3. Have the testing laboratory make one tensile test and one bend test for each 10 tons or fraction thereof of each size of identified steel.

B. Unidentified Steel:

1. Any steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM Standard appropriate for the steel specified for the structure. (Title 24, Section 2712(b).)

2. Have the testing laboratory select samples consisting of two pieces, each 18 in. long, of each size.

3. Have the testing laboratory make one tensile test and one bend test for each 2-1/2 tons or fraction thereof of each size of unidentified steel.

C. Provide continuous inspection for all welding of reinforcement steel.

3.06 STRUCTURAL STEEL INSPECTING AND TESTING

A. Prior to use, test all structural steel for compliance with the specified standards.

1. Material identified by mill test reports, and certified by the testing laboratory, does not require additional testing. Require the supplier to furnish mill test reports to the laboratory for certification.

2. Tag identified steel at the supplier's shop. When steel arrives at the job site without such tags, test it as unidentified steel.

B. Unidentified steel:

1. The testing laboratory shall make one tensile test and one bend test for each 5 tons or fraction thereof of each shape and size of unidentified structural steel.

C. Shop welding:

1. Provide qualified testing laboratory Inspector approved by Office of State Architect.

2. On single pass welds, inspect after completion of welding and prior to painting.

3. On multiple pass welds, and on butt welds with cover pass on the back side, continuous inspection.

D. Field welding: Provide continuous inspection by a qualified testing laboratory Inspector approved by Office of State Architect.

3.07 POWDER DRIVEN CONCRETE FASTENERS

A. Use of Powder Driven Concrete Fasteners for tension loads is limited to support of minor loads, like acoustical ceilings, duct work, conduit.

B. Allowable loads:

1. In general, loads should be limited to less than 100 pounds. However, greater loads may be permitted for special cases when approved by the checking supervisor or field engineer. Those situations that exceed 100 pounds that are approved shall be approved in writing and a copy forwarded to the DISTRICT and the DISTRICT's Inspector.

C. Testing:

1. The operator, tool, and fastener shall be pre-qualified by the project Inspector. He shall observe the testing of the first 10 fastener installations. A test "pull-out" load of not less than twice the design load, or 200 pounds, whichever is greater, shall be applied to the pin in such a manner as not to resist the spalling tendency of the concrete surrounding the pin. Thereafter, random test under the project Inspector's supervision shall be made of approximately 1 in 10 pins, except that when the design load exceeds 100 pounds, one half of the pins shall be tested. Should failure occur on any pin tested, all installations must be tested and any pins failing shall be replaced and retested.

3.08 REJECTED WORK

A. The Owner and its representatives shall at all times have access for the purpose of inspection to all parts of the Work and the shops wherein the Work is in preparation.
B. The Owner and its representatives shall have the right to reject materials and workmanship which are defective or to require their correction.

C. The Owner and its representatives, at any time prior to final acceptance of the entire work, may make an examination of completed work by requesting the Contractor to furnish all necessary facilities, labor and materials to remove or tear out completed work.

D. Work found meeting the requirements of the Contract after removal or tearing out, shall result in additional costs for labor and material being paid by the Owner.

E. Rejected workmanship shall be removed from the project, without charge to the Owner, for examination, reconstruction, and removal.

G. Rejected workmanship not corrected by the Contractor within a reasonable time, fixed by written notice, may be corrected by Owner and expense will be deducted by the Owner from the Contract Sum.

3.09 REPAIR AND PROTECTION

A. Comply with requirements of Section 01045 Cutting and Patching of these Specification.

B. Upon completion of inspection, testing, sample-taking and similar services repair damaged construction and restore substrates and finishes to eliminate deficiencies.

C. Protect repaired construction and work exposed by or for quality control service activities.

D. Repair and protection is the Contractors responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

E. Work performed by the Contractor which is not in accordance with the Contract Documents and which requires remedial action or changing of the final locations of parts of the work shall require the following action steps:

1. Contractor confirms the finding of the Owner or his representative within seven days after receipt of Owners notice.

2. Contractor hires an independent consultant to review the construction problem and propose an alternate solution within 14 days after step number 1.

3. Contractor agrees to compensate the Owner for any expense he incurs to evaluate the proposed solution.

4. Contractor makes the correction or accepts a negotiated reduction in the Contract sum upon Owner's approval of non-conforming work.

3.10 UNCOVERING AND CORRECTION OF WORK

A. If a portion of the work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architects observation and be replaced at the Contractor's expense without change in the Contract Sum or time.

B. Contractor shall promptly correct work rejected by the Architect and bear costs of correcting such rejected work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary due to the correction.

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 GENERAL INFORMATION

1.01 GOVERNING AGENCY

A. The governing agencies having review over this project are as follows:
   1. The Division of the State Architect;
      a. Structural Safety Section.
      b. Fire & Life Safety Section.
      c. Access Compliance Section.
   2. City of Bakersfield:
      a. City of Bakersfield Fire Department (site access, temporary fire extinguishing systems, fire hydrant requirements, testing of fire suppression and detection systems).
      b. Public Works Department (offsite improvements, special transportation permits).
      c. Planning Department (site drainage and storm drain systems).
   3. County of Kern:
      a. Environmental Health Services Department (food service and septic tank permits).
   4. State Fire Marshal.

1.02 LAWS AND REGULATION

A. The project shall be constructed under the Jurisdiction of all laws of the State of California governing the construction of public buildings including:
   1. California Code of Regulations, Title 8.
   2. California Code of Regulations, Title 19, Public Safety, State Fire Marshall Regulations.
   3. California Code of Regulations, Title 24:
      a. Part 1 2022 Building Standards Administrative Code.
      b. Part 2 2022 California Building Code.
      c. Part 3 2022 California Electrical Code.
      d. Part 4 2022 California Mechanical Code.
      e. Part 5 2022 California Plumbing Code.
      f. Part 6 2022 California Energy Code.
      g. Part 9 2022 California Fire Code.
   4. National Fire Protection Assoc., California amended NFPA 72.
   5. Occupational Health and Safety Act.
   6. Interpretive Manuals, Code Rules and Safety Orders of:
      a. State Fire Marshal.
      b. Division of the State Architect.
      c. Division of Industrial Safety.
      d. Department of Industrial Relations.
      e. Other Agencies.

B. Nothing in the plans or specifications is to be construed to permit work not in conformance with any applicable code or regulation.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heating and ventilation, telephone service, water, and sanitary facilities for the project, DSA INSPECTOR/OWNER field office.

B. Temporary Controls: Barriers, enclosures and fencing, water control, fire protection, exterior enclosures, protection of the Work, and security.

C. Construction Facilities: Access roads, access provisions, parking, progress cleaning, field offices and sheds.

D. Nothing in this Section is intended to limit types and amounts of temporary work, utilities, controls or facilities required, and no omission from this Section will be recognized by Architect that such activity is not required for successful completion of the work and compliance with requirements of Contract Documents.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 TEMPORARY UTILITIES

A. Electricity

1. Provide and pay for power service required from Utility source. Pay for any necessary equipment, tools, etc., that are necessary to get the power from the Utility source to the site. Secure all necessary permits , permission, right-of-ways, etc., to get the power service from the Utility source to the site.

2. Provide temporary electric feeder electrical service.

3. Pay cost of energy used.

4. Power Service Characteristics: Verify with PG & E, probably 12 kv, 3-Phase.

5. Provide power outlets for construction operations, with branch wiring and distribution boxes located such that a 100 ft. extension cord is the maximum length extension required. Provide flexible power cords as required.

6. Provide meter.

7. Permanent convenience receptacles may not be utilized during construction.

8. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

    a. Provide 20 ampere duplex outlets, single phase circuits for power tools for every 1000 sq. ft. of active work area.

    b. Provide 20 ampere, single phase branch circuits for lighting.

9. Provide overload protection and ground fault interrupters where required.

10. The suggested electrical distribution system to meet the general requirements would include the following basic components:

    a. A 600 ampere, 480 volt or 480/277 volt, 3-phase or 3-phase, 4 wire service and main switchboard.

    b. One 150 ampere direct burial, 3-phase feeder, one 112.5 kva, 480-120/208 volt, 3-phase transformer and one 400 ampere, 120/208 volt, 3-phase, 4 wire panelboard for the central trailer complex.

    c. Four 60 ampere to 100 ampere direct burial feeders to 4-45 or 75 kva, 480-120/208 volt transformers and four 225 ampere 120/208 volt, 3-phase, 4 wire panelboards. These transformer centers should be strategically placed to meet the various requirements under this Specification. Additional feeders and transformer centers should be provided, as necessary, if the requirements cannot be met with 4.

B. Temporary Lighting

1. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 Watt/sq. ft.

2. Provide and maintain 1 Watt/sq ft lighting to exterior staging and storage area, located in the area designated on the Architectural Site Plan as Future Football/Field Track area, after dark for security purposes.

3. Provide and maintain 0.25 Watt/sq. ft. H.I.D. lighting to interior work areas after dark for security purposes.

4. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

5. Maintain lighting and provide routine repairs.

6. Permanent building lighting may be utilized during construction.

C. Temporary Heat

1. Provide and pay for heat devices bearing UL, FM or other approved labels appropriate for application and heat as required to maintain specified conditions for construction operations.

2. Enclose building prior to activating temporary heat in accordance with "Exterior Enclosures" in this Section.

3. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

4. Maintain minimum ambient temperature of 50 degrees F. in areas where construction is in progress, unless indicated otherwise in Specifications.

5. Vent fuel burning heaters, and equip with individual thermostatic controls.

D. Temporary Ventilation

1. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Telephone Service

1. Provide, maintain and pay for telephone service to Field office and Inspector's field office at time of project mobilization, and maintain until end of all work.

2. Provide and install a FAX machine telephone line in inspectors office.

3. Post a listing of police, fire department, doctor, ambulance service and other similar emergency numbers as well as temporary and home offices of Contractors, principal Subcontractors, Architects, Engineers, Inspector, Owner's Representatives and similar numbers.

F. Temporary Water Service

1. Connect to existing water source for construction operations including setting of meter, if required. Pay connection charges and all necessary costs associated with securing, setting and installing the water meter.

2. Pay cost of water used.

3. Extend branch piping with outlets located so water is available by hoses with threaded connections, at a pressure of 30 psi minimum.

4. Sterilize temporary water piping prior to use.

G. Temporary Sanitary Facilities

1. Provide and maintain required facilities and enclosures. Comply with all minimum requirements of all public agencies having jurisdiction.

1.04 TEMPORARY CONTROLS

A. Barriers

1. Provide complete perimeter barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

2. Provide barricades required by governing authorities.

3. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

B. Fencing

1. Construction: Commercial grade chain link fence.

2. Provide 8 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Permanent fencing indicated on the Architectural Site Plan may be installed per indicated detailing after grading is approved in lieu of security fencing required.

C. Water Control

1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

2. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Fire Protection

1. Volatile liquids shall be kept outside, in a well ventilated location, well removed from open heating or lighting devices, and brought inside in quantities only as needed.

2. Provide housekeeping of volatile liquids and other materials to eliminate spillage and accumulation of oil wastes and provide approved hazardous waste and safety containers.

3. Fire extinguishers:

   a. Type A at low potential locations for fire.

   b. Type ABC dry chemical at remaining locations.

   c. Post warnings and quick instructions at each extinguisher location.

   d. Instruct all personnel at time of their first arrival on proper use of extinguisher and other available site facilities

E. Exterior Enclosures

1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual Specification Sections, and to prevent entry of unauthorized persons.

2. Provide access doors with self-closing hardware and locks.

F. Protection of Installed Work

1. Protect installed Work and provide special protection where specified in individual Specification Sections.

2. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

3. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

4. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

5. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

6. Prohibit traffic from landscaped areas.

G. Security

1. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.

2. Coordinate with Owner's security program.

1.05 CONSTRUCTION FACILITIES

A. Access Roads

1. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

2. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

3. Provide and maintain access to fire hydrants, free of obstructions.

B. Access Provisions

1. Provide ramps, stairs, ladders, and similar temporary access elements to perform the work and facilitate its observation during installation.

2. Permanent stairs used for access shall be covered and protected to ensure freedom from damage at time of completion.

C. Parking

1. Provide temporary gravel surface parking areas to accommodate construction personnel.

2. Do not allow vehicle parking on constructed pavement.

3. Designate one parking space each for the Owner and Architect.

D. Progress Cleaning

1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

2. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

3. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

4. Remove waste materials, debris, and rubbish from site periodically and dispose off-site. No burning (fires) on site allowed.

E. Field Offices and Sheds

1. Contractor's Office: Weather tight, located to provide view of construction area, with interior lighting of 50 foot candles at desk top height and exterior lighting at door; four-110-volt electrical outlets; 2 telephones, one of which shall be for the Inspector; automatic heating, cooling and ventilating equipment; and equipped with sturdy furniture 40 in. deep x 48 in. high; drawing rack for 12 sets of plans and drawing display table, min. 39 in. x 96 in. x 36 in. high.

2. Provide space for project meetings, with table and chairs to accommodate 10 persons.

3. Locate offices and sheds in the area designated on the Architectural Site Plan Sheet A0.01 as Future Football Field/Track area a minimum distance of 50 feet from new structures, with a view of construction area.

4. Provide one 10 in. outdoor type thermometer located on north side of office.

5. Provide connections to applicable utility services.

6. Provide an air conditioned office for use by Inspector & Owner per DISTRICT Inspector article of General Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 REMOVAL

A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work.

B. Remove all such temporary facilities and controls prior to final payment.

C. Remove underground installations to a minimum depth of 2 feet. Recompact and grade site as indicated.

3.02 CONTRACTOR'S OPERATIONS

A. During the course of construction, do not interfere with other buildings or portions of buildings which are to remain occupied. Maintain free and safe passage to and from other buildings which are occupied.

B. Wherever existing services are to be unavoidably interrupted, consult with the Owner's Representative and schedule the interruptions in advance. Overtime work if required will be at no additional cost to the Owner.

C. Attempt to do all jackhammer and other particularly noisy work after normal working hours and on weekends. In all cases, schedule this work in advance with the Owner's Representative. Minimize construction noise by adequate mufflers and other means.

3.03 DUST CONTROL

Control dust as necessary by watering and sprinkling.

3.04 FIRE HAZARD AND BURNING

A. The Contractor is hereby made aware of the fire hazard that exists at the site.

B. Exercise all possible safety precautions to prevent fires and be responsible for any negligence of Subcontractors causing fires or creating fire hazards.

C. No burning of any kind shall be permitted.

END OF SECTION

SECTION 01 60 00

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Definitions.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 DEFINITIONS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Named products: items identified by manufacturer's product name, including make and model as identified in published product literature current as of Contract Document date.

C. Materials: products substantially shaped, cut or worked or otherwise fabricated, processed, or installed to form a part of the work.

D. Equipment: Product with operational parts, motorized or manual, that requires service connections.

1.04 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's written instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

D. Schedule delivery to minimize long term storage at the site and to prevent overcrowding of construction space.

E. Coordinate delivery with installation time to minimize holding time for flammable, hazardous, easily damaged, or other losses.

F. Inspect products upon delivery to ensure compliance with Contract Documents, products are not damaged and they are properly protected.

1.05 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well drained area. Do not mix with foreign matter.

F. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.06 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming 2 or More Manufacturers: Products of manufacturers named and meeting Specifications, or submit a request for substitution for any manufacturer's product not named.

C. Product requirements including the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or similar phrases, the Architect will select the color, pattern and texture from the product line selected which complies with other specified requirements.

D. All products specified and/or equal are required to be available by transport within 24 hrs of project site. Contractor shall stock spare parts and maintain a staff trained, certified employees in and office that can respond within 24 hours from the school site for repairs. All products must be made and supplied within the United States.

1.07 REQUESTS FOR SUBSTITUTIONS

A. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are subject to requirements specified in this Section for substitutions.

B. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.

C. Identify product by Specifications Section and Article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.

D. Attach product data as specified in Section 01300.

E. List similar projects using product, dates of installation, and names of Architect/Engineer and Owner.

F. Give itemized comparison of proposed substitution with specified product, listing variations, and reference to Specifications Section and Article numbers.

G. Give quality and performance comparison between proposed substitution and the specified product.

H. Give cost data comparing proposed substitution with specified product, and amount of net change to Contract Sum.

I. List availability of maintenance services and replacement materials.

J. State effect of substitution of construction schedule, and changes required in other work or products. Include Contractor's waiver to rights to additional payment or time, that may become necessary because of the failure of the substitution to perform adequately.

K. Substitution Warranty: All submittals of Request for Substitution under the General and Supplementary Conditions shall be accompanied by a Cover Page as specified in Supplementary Conditions and Substitution Warranty. Substitution will not be accepted without both documents. In addition, Contractor shall warrant in writing on his letterhead, that he accepts complete responsibility for additional costs required for modifications to building or other materials and equipment, and additional coordination of work.

1.08 SUBSTITUTIONS

A. Requests for substitutions will be considered per Public Contracts code section 3400 and Article 28 of the General Conditions. Subsequent requests will be considered when a product becomes unavailable through no fault of the Contractor or other conditions beyond control of Contractor.

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

1. Comparison of qualities of proposed substitution with that specified.

2. Changes required in other elements of work because of substitution.

3. Effect on construction schedule.

4. Cost data comparing proposed substitution with product specified.

5. Required license fees or royalties.

6. Availability of maintenance service, and source of replacement materials.

C. A request constitutes a representation that the Contractor:

1. Has investigated proposed product and determined that it meets or exceeds in all respects the quality level of the specified product, or that the cost reduction offered is ample justification for acceptance.

2. Will provide the same warranty for the Substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner for review or redesign services associated with reapproval by the Architect, and authorities.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:

1. Submit nine (9) copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.

3. The Architect will notify Contractor, in writing, of decision to accept or reject request. For a period of 5 days after Board Award of the Board of Trustees of the Kern High School District, Architect will consider written requests from Contractor for substitutions when that product has been listed on the form provided and submitted with General Contractor's Bid Documents.

F. No substitution of materials will be permitted unless such substitution has been specifically approved in writing for this work by the Architect.

G. Substitutions for products specified will only be considered per Public Contracts Code Section 3400 and Article 28 of the General Conditions unless a specified product becomes unavailable through no fault of the Contractor after the board award by the Kern High School District Board of Trustees.

H. Substitution requests submitted to the Architect after the 5 day period after the Board Award, unless due to unavailability of product through no fault of the Contractor or a product not being feasible per above, shall require reimbursement by the Contractor within 15 days of the invoice from the Architect for the Architect and his consultant's evaluation and review time at their Direct Personnel Expense costs (three times actual salary expense). This expense is payable whether or not the substitution request is approved. Invoicing for the evaluation and review time will also include any reimbursable expenses such as telephone, mailing, facsimile, overnight delivery, mileage expense, etc. which may be incurred as a result of this evaluation. Failure by the

Contractor to reimburse the Architect for substitution evaluation and review within the 15 day period described will result in the Architect not signing the Contractor's current payment request application. Signature will not be made on the payment request application until the Architect receives reimbursements in question. Refer to General Conditions "Payments Withheld" for causes for withholding payments.

I. Substitution products shall not be ordered or installed without written acceptance. Substitution products not properly approved and authorized may be considered defective work and subject to the Owner's determination of an appropriate amount of reduction in the Contract Cost.

END OF SECTION

SECTION 01 65 00

STARTING OF SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

C. Testing, adjusting, and balancing.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner 7 days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of responsible Contractors' personnel in accordance with manufacturers' written instructions.

G. When specified in individual Specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01400 that equipment or system has been properly installed and is functioning correctly.

1.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel 2 weeks prior to date of Substantial Completion. Notification will be made in writing to the DISTRICT with sufficient time to allow the DISTRICT to notify its employees.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within 6 months, at no cost to the Owner.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, emergency, safety procedures, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed upon times, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.05 TESTING, ADJUSTING, AND BALANCING

A. Contractor will appoint, employ, and pay for services of an independent firm to perform testing, adjusting and balancing.

B. Reports will be submitted by the independent firm to the Architect indicating observations and results of tests and indicating compliance or noncompliance with specified requirements and with the requirements of the Contract Documents.

END OF SECTION

SECTION 01 70 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and the General Conditions and ready for Architect's review. No punch list items are to remain incomplete. If punch list items remain incomplete a dollar value will be placed upon incomplete items and 125% of that amount above $10,000 and 150% below $10,000 will be withheld until those items are completed.

B. Provide submittals to Architect that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.04 FINAL CLEANING

A. Execute final cleaning immediately prior to substantial completion per the General Conditions and this paragraph. Owner may provide cleaning acceptable to the Owner at completion of work per the General Conditions.

B. Clean interior and exterior glass and surfaces exposed to view to a dust free condition; remove temporary labels, stains, films and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas. Remove all stains, marks, paint, etc. from all curbs, walks, etc.

G. Remove waste and surplus materials, rubbish, and temporary construction facilities and protection from the site. Hand rake or blow clean entire site where new construction exists to remove debris, plaster, rocks, etc.

H. Pay for District's staff to clean, wax and polish flooring to District's standards.

I. Tops and bottoms of wood doors sealed.

J. Work cleaned, free of stains, scratches and other foreign matter.

K. Replacement of damaged and broken materials.

L. Finished and decorative work shall have marks, dirt and superfluous labels removed.

1.05 ADJUSTING

Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.06 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work using red ink or red colored pencil (not indelible), dating and clouding entry. Use different colors for overlapping changes.

1. Contract Drawings - Blueline prints.

2. Specifications.

3. Addenda.

4. Change Orders and other Modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.

6. Miscellaneous submittals, bound or filed, ready for use and reference.

B. Store Record Documents separate from documents used for construction in a secure, fire resistive location and provide access to Architect and Owner's Inspector for use and reference during normal working hours. Contractor is liable and responsible for inaccuracies in record documents even though they become evident at some future date.

C. Record information concurrent with construction progress, carefully and correctly drawn on the prints accurately located and dimensioned from finished surfaces of building walls. Record drawings and documents must be concurrent with the present payment request. Failure to keep

the record drawings and documents current will result in disapproval of the present payment request.

1. Any work not installed as indicated on drawings.

2. The exact locations and elevations of all covered utilities, including valves, cleanouts, etc.

3. Show all changes in the work.

4. Show all not readily visible lines and items of equipment of the electrical, plumbing, irrigation, heating, ventilating and air conditioning systems.

5. Where deviations from the original drawings occur in the layout of ducts or equipment connected thereto, show "as installed" locations and sizes, including locations of access doors, dampers and control equipment and wiring.

6. Should any item of equipment differ in type, model, catalog number or manufacturer from that called for on original drawings or specifications, such deviations shall be shown on the prints required. The Contractor shall submit a reproducible print along with any operation manuals necessary to evaluate the equipment that deviating from the original drawings. This print shall be verified by the Owner's Inspector (if applicable) and signed, if accurate.

7. Make all entries within 24 hours after installing any part of the work. Progress payment will not be certified unless this is complied with, and the Owner's Inspector (if applicable) has signed (monthly) the record set of prints.

8. The Subcontractor of the trade involved and the General Contractor shall sign all copies of "Record" field notes and drawings certifying to their accuracy.

9. Upon completion of the work and as a condition precedent to approval of final payment, Contractor shall obtain Owner's Inspector's approval of the corrected prints and employ a competent draftsperson to transfer the marked up record set information to a complete set of reproducible transparent sepia mylars of the original Drawings.

D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.

3. Changes made by Addenda and Modifications.

E. Approved Plans: Maintain one set of OSA approved plans with the appropriate approval stamp on each drawing.

F. Preparation of Record Drawings

1. Review completed marked up prints on the site with Architect and Owner's Inspector.

2. Upon Architect's review of marked up prints, proceed with preparation of a full set of sepia mylars by a qualified Architectural draftsperson to transfer record set marked up information to mylars, adding details and notations where applicable. Confirm uncertain items with Architect.

3. Upon Architect's review of marked up mylars, secure and pay for 1 complete set of reproducible Kronar film copies of the mylars. In addition to the set of reproducible duplicates referred to, above the contractor shall provide to the District with two (2) copies of the as-built drawings on CD computer disks, one (1) in AUTOCAD (latest version of Architectural Desktop) and one (1) in AUTOCAD version R14 format or other format designated by the District.

4. Monthly progress payments will be issued to the Contractor only after updated record drawings have been reviewed by the Owner's Inspector. Refer to the General Conditions.

G. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to visible and accessible features of the Work.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.

5. Details not on original Contract Drawings.

H. Submit documents to Architect with claim for final Application for payment.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit 3 sets 30 days prior to final inspection, bound in 8-12 x 11 inch text pages, 3 - D size ring capacity expansion binders with durable plastic covers.

B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, type on 24 pound white paper.

E. Part 1: Directory; listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers, installers and local representative of manufacturer.

F. Part 2: Operation and maintenance instructions; arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

1. Significant design criteria.
2. List of equipment.
3. Parts list for each component.
4. Operating instructions.
5. Maintenance instructions for equipment and systems.
6. Index to manufacturer's literature.
7. Copies of posted instructions.
8. Emergency instructions.
9. Copies of warranties.
10. Inspection procedures.
11. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
12. Chart of valve tag number, location and function of each valve and schematic flow chart.
13. Step by step operating instructions including preparation for starting, shutdown and draining.
14. Certified equipment performance curves.
15. Control systems schematic drawings, systems sequence of operation and wiring diagrams.
16. Parts list of major equipment, including recommended items to be stocked as spare parts.
17. Provide on-site, hands-on training to Maintenance and Operations personnel for all systems, equipment, etc. Refer to Specification Section 01650.

G. Project documents and certificates, including the following:

1. Shop drawings and product data.
2. Air and water balance reports.
3. Certificates.
4. Photocopies of warranties and bonds.

H. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Architect comments. Revise content of documents as required prior to final submittal.

I. Submit final volumes revised, within 10 days after final inspection.

1.08 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in 3 D size ring binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections.

B. Deliver to Project site and place in Maintenance and Operation area; obtain receipt prior to final payment.

1.10. SUBMITTALS

A. Keys delivered and labeled to Owner's satisfaction with written keying schedule. Refer to Specification Section 08710 for additional requirements.

B. Evidence of compliance with requirements of governmental agencies having jurisdiction.

C. Certificates of insurance for products and completed operations.

D. Evidence of payment and release of liens.

E. List of Subcontractors, service organizations, and principal vendors

1. Names.

2. Addresses.

3. Telephone numbers.

4. Emergency telephone numbers for nights, weekends, and holidays.

1.11 SIX MONTH INSPECTION

Participate in a general inspection of finish hardware and HVAC equipment at no cost to the Owner, of the Work described approximately (6) six months beyond the filing date of the Notice of Completion for the purpose of listing items of repair, replacement, etc. for warranty items.

1.12 ELEVEN MONTH INSPECTION

Participate in a general inspection at no cost to the Owner of the Work approximately 11 months beyond the filing date of the Notice of Completion for the purpose of listing items of repair, replacement, etc. for warranty items.

1.13 PROCEDURES

A. Final Completion:

1. Prepare and submit the list required by Section 01027 of these Specifications and any other items as determined.

2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Section 01027 of these Specifications.

3. Certify in writing that:

    a. Contract Documents have been reviewed;

    b. Work has been reviewed for compliance with the Contract Documents;

    c. Work has been completed in accordance with the Contract Documents;

    d. Equipment and systems have been tested as required, and are operational;

    e. Work is completed and ready for final review.

4. The Architect will make a review to verify status of completion.

5. Should the Architect determine that the work is incomplete or defective:

    a. The Architect promptly will so notify the Contractor, in writing, listing the incomplete or defective work. Costs of review by the Architect will be deducted from Contract amount.

    b. Remedy the deficiencies promptly, and notify the Architect when ready for review.

6. When the Architect and the District determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals.

7. Contractor shall furnish a letter to Owner certifying that a representatives of the District Maintenance and Operations Department has been instructed in working characteristics of mechanical and electrical and any other necessary equipment (give name and positions) and that training has been provided in accordance with above.

C. Closeout submittals include, but are not necessarily limited to:

1. Project Record Documents described in this Section;

2. Operation and maintenance data for items so listed in pertinent other Sections of these Specifications, and for other items when so directed by the Architect;

3. Warranties and bonds;

4. Keys and keying schedule; Master keys shall be accounted for in writing;

5. Spare parts and materials extra stock;

6. Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:

    a. Certificates of Inspection;

    b. Certificates of Occupancy;

7. Certificates of Insurance for products and completed operations;

8. Evidence of payment and release of liens;

9. List of Subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays;

10. Final verified report to OSA.

D. Final Adjustment of accounts:

1. Submit a final statement of accounting to the Architect and the District showing all adjustments to the Contract Sum.

2. If so required, the Architect will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

END OF SECTION

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
   1. Cutting and patching.

1.02 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.03 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.
   1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
      a. Contractor's superintendent.
      b. Trade supervisor responsible for cutting operations.
      c. Trade supervisor(s) responsible for patching of each type of substrate.
      d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
      e. HVAC shutdown and sealing of air intakes.
   2. Coordinate work activities with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
   3. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.04 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

B. Preconstruction Inspection Report: From fireproofing material manufacturer's technical representative for preconstruction inspections.

1.05 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.
    l. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

1.06 PRECONSTRUCTION INSPECTION

A. Applied Fire Protection Materials: Where cutting and patching is required of applied fire protection materials, engage fireproofing manufacturer’s technical representative to conduct on-site inspection and assessment of existing fire protection materials and prepare technical report noting recommended patching materials and application methods required to patch and restore rating after cutting.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Fluid-Applied Flashing and Roofing Membrane: Flexible, PMMA-based resin combined with a thixotropic agent for use in combination with non-woven, needle-punched polyester fabric reinforcement to form a monolithic, reinforced flashing and roofing membrane.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
a. Kemper System; Kemperol AC Speed FR.
b. Siplast; Parapro.

c. Soprema; Alsan RS.

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 01 10 00 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
   4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Roofing Membrane Assemblies: Patch roofing membrane penetrations and transitions with reinforced, liquid applied PMMA flashing membrane. Embed roofing granules to match existing roofing granule cap and flashing sheets.
   6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.

1.02 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.03 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.04 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.06 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.07 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
1. Before selective demolition, Owner will remove the following items:
a. <**Insert items to be removed by Owner**>.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.08 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
      f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.02 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.03 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and after flame-cutting operations.

6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 02 42 96 "Historic Removal and Dismantling."

D. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

E. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition[**and cleaned**] and reinstalled in their original locations after selective demolition operations are complete.

3.04 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.05 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 05 12 00 – STRUCTURAL STEEL

PART I – GENERAL

1.1 Description of Work

A. Section includes:

1. Structural steel.
2. Reinforcing steel welded to structural steel.
3. Grout for base plates and bearing plates.

B. Products furnished but not installed under this section

1. Anchor bolts and steel fabrications cast into concrete are installed under Section 03 30 00.

1.2 Applicable Standards (latest editions apply)

A. ASTM – American Society for Testing and Materials

1. A6 – Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
2. A36 – Specification for Steel.
3. A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
4. A123 – Specification for Zinc (Hot Dip Galvanized) Coating on Iron and Steel Products.
5. A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. A307 – Specification for Carbon Steel Externally Threaded Standard Fasteners.
7. A325 – Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
8. A354 – Specification for Quenched and Tempered Steel Bolts and Studs and Other Externally Threaded Fasteners.

9. A449 – Specification for Quenched and Tempered Steel Bolts and Studs.

10. A490 – Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.

11. A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing.

12. A563 – Specification for Carbon and Alloy Steel Nuts, 2004 Edition.

13. A572 – Specification for High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.

14. A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

15. A706 – Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

16. A780 – Specification for Repair of Damaged Hot-Dip Galvanized Coatings.

17. A913 – Specification for High Strength Low Alloy Shapes of Structural Quality Produced by Quenching and Tempering Process.

18. A992 – Specification for Steel for Structural Shapes for use in Building Framing.

19. C1107 – Specifications for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

20. F844 – Specification for Washers, Steel, Plain (Flat) Unhardened for General Use.

B. AISC – American Institute of Steel Construction

1. Specification – AISC Manual of Steel Construction

2. Specification – ANSI/ AISC 360-16 Specifications for Structural Steel Buildings, 2016.

3. Specification – ANSI/ AISC 341-16 Seismic Provisions for Structural Steel Buildings, 2016.

4. Code – Code of Standard Practice for Steel Buildings and Bridges, 2016 Edition. Articles 3.2 and 3.3 and Section 4 and 9 of AISC Code are

superseded by requirements of the General Conditions, Special Conditions and Contract Documents.

C. AWS – American Welding Society

1. D1.1 – Structural Welding Code (Latest Edition).

2. D1.4 – Structural Welding Code – Reinforcing Steel, (Latest Edition).

3. D1.8 – Seismic Supplements.

D. ICC – International Code Council:

1. CBC – California Building Code, 2022 Edition.

E. SSPC – Steel Structures Painting Council's, "Systems and Specifications".

1. SP1 – Solvent Cleaning.

2. SP2 – Hand Tool Cleaning.

3. SP3 – Power Tool Cleaning.

4. SP6 – Commercial Blast Cleaning.

1.3 Definitions:

A. Architecturally Exposed Structural Steel (AESS).

1. Structural steel framing exposed to view from the building exterior.

2. Structural steel framing noted as AESS on Drawings.

B. Heavy Shapes: ASTM A6, Group 3 shapes with flanges thicker than 1 1/2 inches and Group 4 shapes and Group 5 shapes; welded built-up members with plates exceeding 2-inches in thickness.

C. Demand Critical Weld:

1. Complete penetration welds in beam to column connections, including flange, flange reinforcement, stiffener plate and doubler plate welds.

2. Complete penetration welds of column splices and of columns to base plates.

3. Other complete penetration welds indicated as "Demand Critical" on Drawings.

1.4 Submittals

A. Shop Drawings:

1. Provisions of AISC Code, Section 4, are superseded by requirements of General Conditions, and Special Conditions.

2. Show size and location of structural members; give complete information necessary for the fabrication of members including cuts, copes, holes, stiffeners, camber, type and size of bolts and welds, surface preparation and finish; show methods of assembly.

3. Indicate welded connections using standard AWS symbols and clearly distinguish between shop and field welds.

4. Identify high strength bolted connections (snug-tight or slip-critical).

B. Certificates of compliance with specified standards.

1. All steel.

2. Fasteners, including nuts and washers.

3. Welding electrodes.

4. Studs.

5. Non-shrink Grout.

6. Reinforcing steel.

7. Primer Paint.

C. Certified manufacturer's test reports: Submit to Testing Laboratory for record purposes.

1. All Steel: Tensile tests and chemical analysis, welds. Include all trace elements for steel to receive Seismic Critical Welds.

2. High Strength bolts: As per ASTM A325-06, Section 1.4; or A490-06, Section 1.6.

3. Reinforcing Steel: Chemical, tensile and bend tests.

4. Heavy Shapes: Charpy V-Notch

D. Product Data

1. Welding Electrodes

E. Welder Certification

F. Written Welding Procedure Specification (WPS) in accordance with AWS D1.1 requirements for each different welded joint proposed for use, whether prequalified or qualified by testing.

1. Indicate as-detailed configuration and also the maximum and minimum fit-up configurations.

2. Identify specific electrode and manufacturer.

3. List actual values of welding parameters to be used so that clear instruction is provided to welders.

G. Procedure Qualification Record (PQR) in accordance with AWS D1.1 for all procedures qualified by testing.

H. Samples: As requested by the Testing Laboratory.

1.5 Quality Assurance

A. Code and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges", 2016 Edition. Articles 3.2 and 3.3 and Sections 4 and 9 of AISC Code are superseded by requirements of the General Conditions, Special Conditions and Contract Documents.

2. AWS D1.1 "Structural Welding Code – Steel" and AWS D1.8 “Seismic Supplement”.

3. CBC Chapter 22A, Section 2205A.

4. CBC Chapter 22A, Section 2205A.4.2.

5. Research Council on Structural Connections – “Specifications for Structural Joints Using ASTM A325 or A490 Bolts”

6. ANSI/ AISC 360-06 Specifications for Structural Steel Buildings.

7. Specification – ANSI/ AISC 341-16 Seismic Provisions for Structural Steel Buildings, 2016.

B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS D1.1, "Qualification" requirements.

1. Qualify welders in accordance with AWS D1.1 for each process, position and joint configuration.

2. WPS's for each joint type shall indicate proper AWS qualification and be available where welding is being performed.

3. Welders who have not performed the required welding procedure for a period of six or more months shall be prequalified.

4. Welders whose work fails to pass inspection shall be prequalified before performing further welding.

5. If recertification of welders is required, retesting will be Contractor's responsibility.

C. Field Measurement: Field verify all existing conditions affecting steel members and steel member placement prior to fabricating and installation of steel members.

D. Pre-Fabrication/Pre-Erection Conferences: Contractor shall schedule meeting with Structural Engineer, Testing Laboratory and the Steel Fabricator and Erector's personnel supervising shop and field welding to review welding procedures and inspection requirements for "Seismic Critical Welds."

E. Welding Inspector Qualifications: All welding inspectors shall be AWS certified welding inspectors (CWI) as defined in AWS Standard and Guide for Qualification and Certification of Welding Inspectors, latest edition. Welding inspector's qualifications shall be submitted to the Structural Engineer for approval. Inspectors shall be trained and thoroughly experienced in inspecting welding operations. Comply with AWS section 6.1.3.

1.6 Scheduling and Sequencing

A. Ensure timely delivery of items to be embedded in work of other sections such as cast-in-place concrete; furnish setting drawings or templates and directions for installation.

PART II – PRODUCTS

2.1 Materials

A. General: All steel shall be identified as required by ICC CBC Section 2203A. Steel which is not properly identified shall be tested to show conformance with requirements of applicable ASTM Standard at Contractor's expense.

B. Exposed Surfaces: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding or by welding and grinding, prior to cleaning, treating and applying surface finishes.

C. Steel W Shapes: ASTM A992

1. Heavy Shapes (see "Definitions" in this Section) shall be supplied with Charpy V-Notch testing in accordance with ASTM A6 Supplementary Requirement S5. The impact test shall meet a minimum average value of 20 ft-lbs absorbed energy at +70 degrees Fahrenheit and shall be conducted in accordance with ASTM A673, frequency H, with the following exceptions:

a) The center longitudinal axis of the specimens shall be located as near as practical to midway between the inner flange surface and the center of the flange thickness at the intersection with the web mid-thickness.

b) Tests shall be conducted by the producer on material selected from a location representing the top of each ingot or part of an ingot used to produce the product represented by these tests.

F. Steel Channels and Angles: ASTM A36; or dual certified ASTM A36/A572.

G. Steel Plates and Bars:

1. ASTM A36 where designated on Drawings.

2. ASTM A572, Grade 50, unless indicated otherwise.

H. Steel Pipes: ASTM A53, Type S, Grade B.

I. Steel Tubing: ASTM A500, Grade B.

J. Standard Threaded Fasteners: ASTM A307, Grade A, bolts with ASTM A563 hex nuts.

K. High Strength Bolts:

1. ASTM A325, type 1; unless indicated otherwise.

2. ASTM A490 where designated on Drawings.

3. Nuts: ASTM A563

4. Washers: ASTM F436

5. Load indicating devices: requires approval of the Architect and DSA

L. Anchor Bolts (unless otherwise indicated on Drawings):

1. F1554, Grade as indicated on Structural Drawings; unless indicted otherwise.

2. Washers: ASTM F844; 5/16-inch minimum thickness.

3. Nuts: ASTM A563

M. Welding Materials: AWS D1.1; type required for base metals being welded.

1. Electrodes shall be low hydrogen.

2. Electrodes for "Demand Critical Welds" shall have a minimum Charpy V-notch toughness of 20 ft-lbs at -20 degrees Fahrenheit.

N. Shop Primer:

1. Type A Primer: Conforming to federal, state and local v.o.c. regulations; containing no lead or chromates; Tnemec Series 88HS, or approved equal.

2. Type B Primer: Organic zinc-rich urethane; conforming to federal, state and local v.o.c. regulations; Class A coating, Tnemec "90-97 Tneme-Zinc", or approved equal.

O. Studs

1. Headed Shear Connector Studs; AWS D1.1, Type B; as-welded size as shown on Drawings.

2. General Purpose Studs; AWS D1.1, Type A; as-welded size and configuration as shown on Drawings.

P. Reinforcing Steel: ASTM A706, deformed.

Q. Nonshrink Grout:

1. Premixed, nonmetallic, noncorrosive product, complying with ASTM C1107, Class B or C, at flowable consistency for 30 minutes for temperature extremes of 45 to 90 degrees F.

2. Subject to compliance with requirements, provide one of the following:
Masterflow 928, Master Builders.
Five Star Grout, U.S. Grout Corp.
Sika Grout 212, Sika Corp.

2.2 Fabrication

A. Fabricate structural steel in accordance with AISC Specification and AISC Code.

1. Architecturally Exposed Structural Steel conform to Section 10 of AISC Code.

2. Fabricate joints in heavy shapes in accordance with additional requirements of Section A 3.1(c) of AISC Specification.

3. Fabrication of flange cuts for RBS connections shall be in accordance with AISC 358 Section 5.7.

B. Connections: Where connection is not shown, design in accordance with standard practice unless otherwise directed by the Architect.

C. Drill, not punch, holes centered 6" or less from an edge to be complete penetration welded.

D. Assembly with High Strength Bolts

1. Construct connections in accordance with ICC CBC, Chapter 22A, using provisions for slip-critical joints, unless snug-tight bolts are indicated on Drawings.

2. Use standard holes (bolt diameter plus 1/16 inch), unless otherwise indicated on Drawings.

E. Assembly with Standard Threaded Fasteners

1. Draw up tight, check threads with chisel or provide approved lock washers or self-tightening nuts.

2. Provide beveled washers under bolt heads or nuts resting on surfaces exceeding five percent slope with respect to head or nut.

F. Welded Construction

1. Examine fit-up of joint for conformance with welding procedure specification. Do not proceed with welding until fit-up is inspected by Testing Laboratory.

2. Weld in accordance with AISC Specification using manual shielded arc method or flux cored arc method in accordance with AWS D1.1. Weld only in accordance with welding procedure specifications (WPS) for joint, which are to be available to welders and inspectors during the production process.

3. Groove welds shall be complete joint penetration welds, unless specifically designated otherwise on Drawings. Groove preparation is at Contractor's option, subject to qualification in accordance with AWS D1.1. Runoff plates shall be in accordance with AWS D1.1; end dams shall not be used.

4. Remove back-up plates for complete joint penetration wields where indicated in Contract Documents or when requested by Testing Laboratory to perform nondestructive testing. Remove at no additional cost to Owner.

5. Complete penetration groove weld Heavy Shapes in accordance with AISC Specification Section J1.7 for tension splices.

6. The following additional requirements apply to "Seismic Critical Welds":

   a) Use electrodes specified for Seismic Critical Welds.

   b) At beam flange to column welds, remove back-up plates, back gouge, clean by grinding and back weld with reinforcing fillet, unless Drawings specifically indicate that back-up bar may remain. Do not place reinforcing fillet until Testing Lab has inspected groove weld.

   c) Cut off runoff plates 1/8-inch from edges and grind smooth (not flush).

7. Weld reinforcing steel to structural steel in accordance with AWS D1.4 using prequalified procedures.

8. Grind exposed welds of Architecturally Exposed Structural Steel smooth and flush with adjacent finished surface.

G. Column Bases: Finish in accordance with AISC Specification. Lack of contact bearing with column shall not exceed 1/16 inch.

H. Bearing Plates: Provide for attached or unattached installation under beams, and girders resting on footings, piers, and walls.

I. Headed Studs: Automatically end weld in accordance with AWS D1.1 and manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and steel member.

2.3 Finishes

A. Preparation of Surfaces

1. All surfaces shall be cleaned per SSPC-SP1 "Solvent Cleaning" to remove oil and grease prior to any other surface preparation.

2. After fabrication, prepare the following steel surfaces in accordance with SSPC-SP2 "Hand Tool Cleaning":

a) Steel work to be spray-fireproofed.

b) Steel work to be encased in concrete.

c) Steel work to be hot-dip galvanized.

3. After fabrication, prepare the following steel surfaces in accordance with SSPC-SP3 "Power Tool Cleaning":

a) Interior steelwork to be painted with Type A Primer.

4. After fabrication, prepare the following steelwork in accordance with SSPC-SP6 "Commercial Blast Cleaning":

a) Exterior steelwork.

b) Architecturally Exposed Structural Steel.

c) Interior steelwork to receive Type B primer.

B. Painting

1. Apply one coat of primer to all structural steel surfaces unless otherwise noted. Do not paint the following surfaces:

a) Surfaces to be encased in concrete except initial two inches.

b) Surfaces to contact high-strength bolt connections, except surfaces painted with Type B Primer.

c) Surfaces to be field welded.

d) Surfaces to be spray fireproofed.

e) Top surfaces of beams to receive metal deck.

2. Use Type A Primer applied at 2.0 mils minimum dry film thickness on all normal environment interior steelwork.

3. Use Type B Primer applied at 2.5 mils minimum dry film thickness on all exterior steelwork and on interior steelwork subjected to wet conditions or corrosive fumes (noted on Drawings).

4. Permit thorough drying before shipment.

C. Hot dip galvanizing:

1. Hot dip galvanize the following items:

a) Items noted on Drawings as galvanized.

b) Fasteners which connect galvanized components, except A490 bolts shall not be hot-dip galvanized.

2. Galvanized in accordance with the following:

a) Steel members and fabrications: ASTM A123.

b) Bolts, nuts, washers: ASTM A153.

3. Treat faying surfaces of slip-critical high strength bolted connections to achieve Class C surface in accordance with ICC CBC Chapter 22A.

2.4 Source Quality Control

A. Inspection and testing will be performed under provisions of Section 01400.

B. The Testing Laboratory will:

1. Review manufacturer's test reports for compliance with specified requirements.

2. Verify material identification.

3. Inspect high-strength bolted connections as required by CBC Section 2204A.2 for conformance with CBC Chapter 22A.

4. Inspect welding as required by ICC CBC Section 2204A.1 in accordance with AWS D1.1. The following should be performed with each weld:

a) Verify Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder performing the weld. Welds not executed in conformance with the WPS are rejectable.

b) Verify fit-up meets tolerances of WPS and mark joint prior to welding.

c) Verify welding consumables per Contract Documents and WPS.

d) Verify welder qualification and identification.

e) Verify amperage and voltage at the arc with hand-held meters.

f) Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.

5. For Seismic Critical Welds, inspect removal of back-up and run-off plates, preparatory grinding and execution of reinforcing fillet.

6. Nondestructive test all complete penetration groove welds larger than 5/16 inches by ultrasonic methods for conformance with the weld qualify and standard of acceptance of AWS D1.1 for welds subject to tensile stress. Pass sound through the entire weld volume from two crossing directions to extent feasible.

7. Ultrasonically inspect base metal thicker than 1/2-inches for discontinuities behind welds in accordance with CBC Section 2204A.1.

8. Periodically, inspect and test stud welding as required by CBC Section 2204A.1 in accordance with AWS D1.1; review preproduction testing and qualification, periodically inspect welding and perform verification inspection and testing.

PART III – EXECUTION

3.1 Examination

A. Examine existing structure to support construction and verify the following:

1. Location and elevation of bearings and anchor bolts are correct.

2. Other conditions adversely affecting erection of steel are absent.

B. Do not begin erection before unsatisfactory conditions have been corrected.

3.2 Preparation

A. Supervise setting of anchor bolts and other embedded items required for erection of structural steel. Be responsible for correct bearing of steel and correct location of anchor bolts.

3.3 Erection

A. Erect structural steel in accordance with AISC Specification and AISC Code.

B. Grouting Baseplates and Bearing Plates: Prior to erection, clean and roughen concrete surface beneath baseplate to full ¼" amplitude; clean bottom surface of baseplate of bond-reducing materials. After columns have been positions and plumbed, flow nonshrink grout solidly between bearing surfaces to ensure no voids remain. Comply with manufacturer's recommendations for mixing, placing, finishing and curing of grout.

C. Where erection requires performing work of fabrication on site, conform to applicable standards of Fabrication Article.

D. Field corrections of major members will not be permitted without the Architect's prior approval.

E. Gas Cutting: Use of flame cutting torch will be permitted only after the Architect's prior approval and only where metal cut will not carry stress during cutting, stresses will not be transmitted through flame-cut surface and cut surfaces will not be visible in finished work.

1. Make cuts smooth and regular in contour.

2. To determine effective width of members so cute, deduct 1/8-inch from least width at cut edge.

3. Make radius of cut fillet as large as practical, but in no case less than one inch.

4. Do not use flame cutting torch to align bolt holes.

F. Field Touch-Up Painting: After erection, touch-up or paint field connections and abrasions in shop paint with same paint used for shop painting. Touch up galvanized surfaces in accordance with ASTM A780.

3.4 Cleaning

A. After erection, thoroughly clean surfaces to foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fire-retardant coating, paint or concrete.

3.5 Field Quality Control

A. The owner's Testing Laboratory will:

1. Inspect erected structural steel as required to establish conformity of Work with reviewed shop drawings and Contract Drawings.

2. Inspect high-strength bolted connections as required by ICC CBC Section 1704A.3.3.

3. Inspect welding as required by ICC CBC Section 1704A.3.1 in accordance with AWS D1.1. The following should be performed with each weld:

   a) Verify Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder performing the weld. Welds not executed in conformance with the WPS are rejectable.

   b) Verify fit-up meets tolerances of WPS and mark joint prior to welding.

   c) Verify welding consumables per Contract Documents and WPS.

   d) Verify welder qualification and identification.

   e) Verify amperage and voltage at the arc with hand-held meters.

   f) Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.

4. For Seismic Critical Welds, inspect removal of back-up and run-off plates, prepatory grinding and execution of reinforcing fillet.

5. Nondestructive test all complete penetration groove welds larger than 5/16 inches by ultrasonic methods for conformance with the weld qualify and standard of acceptance of AWS D1.1 for welds subject to tensile stress. Pass sound through the entire weld volume from two crossing directions to extent feasible.

6. Periodically, inspect and test stud welding as required by ICC CBC Section 1704A.3 and 2212A.3in accordance with AWS D1.1; except that test studs shall be subjected to a 90° bend test by striking them with a hammer. Review preproduction testing and qualification, periodically inspect welding and perform verification inspection and testing.

END OF SECTION 05 12 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Rough carpentry

1.2 REFERENCES

A. ASTM International
   1. ASTM D 3498 – Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems.
   2. ASTM D 4601 – Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
   3. ASTM E 4 – Surface Burning Characteristics of Building Materials.

B. Chapters 7 and 23, 2022 California Building Code, CBC.

C. DOC PS 1-19 - Department of Commerce Product Standard, U. S. Product Standard for Construction and Industrial Plywood.

D. DOC PS 20-20 - Department of Commerce Product Standard, American Softwood Lumber Standards.

E. DOC PS 2-18 - Department of Commerce Product Standard, U. S. Product Standard for Construction, Performance Standard for Wood-Based Structural-Use Panels.

F. ANSI A135.4-1995 - Basic Hardboard.

G. WWPA - Western Lumber Grading Rules 88, Latest Edition, by Western Wood Products Association.

H. HPVA HP-1 – American National Standard Institute, Hardwood Plywood and Veneer Association, 2009 Edition.

I. APA - The Engineered Wood Association. The Construction Guide.

J. AQMD - Local Air Quality Management District Regulations.

K. AWPA C1, C2, C3, C9, C27 - American Wood Preservers Association - Manual of Recommended Practice.

L. AWPA C20-03 - American Wood Preservers Association Standards, Structural Lumber – Fire-Retardant Treatment by Pressure Process

M. WCLIB - West Coast Lumber Inspection Bureau Standard Grading Rules No. 17.

N. Title 8 - California Code of Regulations, Construction Safety Orders.

O. ICC –ES – International Code Council Evaluation Service, Inc. Legacy Reports.

P. RIS – Redwood Inspection Service, Standard Specifications for Grades of California Redwood Lumber, 2019.

Q. SCAQMD – South Coast Air Quality Management District
1. Rule 1168 – Adhesives and Sealants

1.3 SUBMITTALS

A. Product data and current ICC Legacy Reports for framing anchors.

1.4 QUALITY ASSURANCE

A. Rough Carpentry Lumber: Visible grade stamp on all products required.

B. Grade Stamp: Association under whose rules it was graded, or official grade mark of other recognized grading agencies using grading rules, equivalent to WWPA or WCLIB.

C. Nailing guns and nail operators shall be approved in accordance with Title 8 Construction Safety Orders.

1.5 DELIVERY, STORAGE AND HANDLING

A. Do not deliver rough carpentry items until site conditions are adequate to receive the Work. Protect items from weather while in transit.

B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raise above ground and out of contact with damp or wet surfaces. Stack lumber and plywood and provide for air circulation within and around stacks and under temporary covers. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.

C. Install bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles materials, erection equipment or other loads are carried by frame during its erection.

1.6 PROJECT CONDITIONS

A. Cooperate with other trades in coordinating their Work with the Work of this Section. Provide wood grounds, blocking and nailer where indicated or as required for Work of other trades.

PART 2 PRODUCTS

2.1 ROUGH CARPENTRY MATERIALS

A. Lumber: Graded in accordance with WWPA or WCLIB; maximum moisture content of 19 percent at time of installation. Provide Douglas Fir Larch for structural and framing lumber, surfaced four sides to standards of the grading association unless otherwise indicated on Drawings, use the following grades:
   1. Joists, rafters, beams, lintels, horizontal framing, posts, studs and vertical framing: No. 1 unless otherwise indicated or noted on drawings.
   2. Non-bearing studs and plates, non-structural furring, concealed blocking, stripping and miscellaneous nailers and backing: No. 2 unless noted otherwise in the structural drawings.
   3. Structural Drawings take precedence for lumber grades.
   4. All lumber in contact with concrete shall be pressure treated.

B. Exterior Trellis Construction: Dimension Lumber and Timber per DOC PS 20. Species: Douglas-fir larch Grade; Select Structural, WCLIC. Provide material hand-selected for uniformity of appearance and free from characteristics, on exposed surfaces and edges that would impair finish appearance, including decay, honeycomb, knot-holes, shakes, splits, torn grain, and wane.
   1. Provide timber framing complying with requirements, according to grading rules of grading agency indicated.
   2. For exposed lumber and timber to receive a stained or natural finish omit grade stamp and provide Certificates of Grade compliance issued by grading agency.

C. Plywood: Section 2303.1.4 CBC, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification; Exterior. Thickness as indicated, span rating sized for spacing.
   1. For natural finished plywood: Panel Grade N veneer on face and B on back side.
   2. For painted finish: APA Sanded Plywood Panels, A-C Group 1, Exterior, sanded face, touch sanded back side.
   3. Thickness: Minimum 5/8 inch or as indicated on Drawings.
   4. Plywood shall be FSC certified; other sustainable forestry certifications will not be accepted.

D. Roof Plywood Decking: requiring FM 1-90 Wind and Fire Classification, minimum 5/8” (19/32 inch) thick. Section 2304.7.2 CBC, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification: Exposure 1, B-C Veneer Grade, sanded 1 side. Thickness as indicated, span rating sized for spacing.
   1. Fasteners to attach wood decking to Metal decking: Dekfast #12 Phillips Head Screw or equal and as recommended by roof manufacturer. Non-corrosive, drill points, Factory Mutual approved for Class 1-90 uplift, with lengths sufficient to penetrate deck minimum of 3/4 inch with 3 inch metal stress plate.

E. Preservative (Pressure) Treated Lumber: Section 2303.1.8 Conform to AWPA Manual of Recommended Practice, kiln dry after treatment. Use preservative complying with AWPA C2 lumber and C9 plywood, latest edition. Products NOT containing arsenic or chromium. Conform to AQMD, Local Regulations.

1. Douglas Fir Larch, used as required by Section 2303.1.8.1, CBC, shall conform to the following:
    a) Lumber shall be WWPA or WCLIB grade stamped.
    b) Lumber shall be No. 1 grade or better unless indicated otherwise on Drawings.

F. Waterproof Membrane: ASTM D4601; Type II, asphalt saturated glass felt.

G. Plywood Backing Panels – Backboards
1. Telephone and Electrical Equipment backboards, fixed equipment, cabinets, grab bars, door stops and plates: DOC PS 1, Exposure 1, APA A-C, sanded, Veneer Grade, fire-retardant treated, in thickness indicated or, if not indicated, not less than 5/8 inch nominal thickness. Installed “A” side out for paint finish.

H. Nails, Spikes and Staples: Section 2304.9 CBC, Galvanized for exterior applications, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application. Comply with Table 2304.9.1. Use common nails only.

I. Bolts, Nuts, Washers, Lags, Pins and Screws: Section 2304.9 CBC, sized to suit application, galvanized for exterior locations, high humidity locations and treated wood, plain finish for other interior locations. Full diameter body bolts only per ASME B18.2.1(.2) or B18.2.6 for structural applications.

J. Expansion type or powder actuated type for anchorage to solid masonry or concrete.
1. Kwik Bolt TZ (KB-TZ) Concrete Anchor, 3/8 to 3/4 inch diameter, ICC ESR-1917, by Hilti Inc., Tulsa, OK, Strong-Bolt concrete anchor, 1/2, 5/8, 3/4 and 1 inch diameter, ICC ESR-1771, by Simpson Strong-Tie, Pleasanton, CA , Or equal with ICC Report Number.
2. Kwik Bolt 3 (KB3), 1/4 to 3/4 inch diameter, ICC ESR-1385, by Hilti. Wedge-All grout-filled CMU anchor, 3/8, 1/2, 5/8, and 3/4 inch diameter, ICC ESR-1396, by Simpson Strong-Tie. Or equal with ICC Report Number.

K. Stock Framing Connectors: Section 2304.9 CBC types indicated on Drawings, galvanized, with nails fully driven in all holes in each face of connector. Conform to the following:
1. Manufacturers: Simpson Strong Tie Co., Inc., San Leandro, CA, United Steel Products, Montgomery, MN. or equal as approved in accordance with Division 01 General Requirements for Substitutions.
2. ICC Listed.

L. Non-Stock Framing Connectors: Conform to details.

M. Nonshrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency for application and a 30 minute working time. Acceptable

Manufacturers: Dayton Superior, Miamisburg, OH; Sonneborn, Shakopee, MN; Novex Systems International, Clifton NJ, or equal.

N. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

O. Adhesives: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to SCAQMD Rule 1168, paragraph (b)(31) or (b)(32).

PART 3 EXECUTION

3.1 LAYOUT MARKINGS

A. Layout markings shall not be made with xylene-based inks, paint, or dyes, or with other solvent-based products that may bleed through finishes.

3.2 FRAMING, FURRING AND STRIPPING

A. Erect wood framing, furring, stripping and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch in 10 feet, non-cumulative.

B. Construct members of continuous pieces of longest possible lengths.

C. Construct and erect required headers and lintels.

D. Double wall framing members at openings over 100 square inches. Space short members above and below openings in same manner as for walls.

E. Provide double joist headers at joist ends and around openings unless otherwise indicated on Drawings. Bridge joists and rafters to conform Section 2304 CBC and as noted on plans. For pre-manufactured joists, provide bridging in accordance with manufacturer’s recommendations.

F. Construct walls with studs of size and spacing indicated, 16 inches on center unless otherwise indicated on drawings. Install single sill member at bottom and double plate at top. Stagger upper and lower members of double plate with joints not less that 4 feet o.c. or as indicated on Drawings. Where sill or any wood member contacts concrete or masonry, install preservative-treated lumber.

G. Provide one row of solid blocking not less than 2 inch nominal thickness and same width of stud at ceiling and floor lines and at spacing not to exceed 8 feet on center vertically. Fit snugly and attach with not less than two 16d nails.

H. Install 3 studs at corners.

I. Conform to Section 2308.9.8, CBC, where pipes penetrate sills or plates.

J. Cutting and Notching: Conform to Section 2308.9.10, CBC.

K. Bored Holes: Conform to Section 2308.9.11, CBC.

L. Conform to Section 717, California Building Code for fire blocks and draft stops. Fire blocks and stops at 10-feet intervals and at ceiling level

3.3 PLYWOOD SHEATHING

A. Thickness as indicated on the Drawings.

B. Boundary Nailing: Not less than 3/8 inch from edge, spaced not more than 6 inches on center, unless noted otherwise on Drawings.

C. Blocking: Panel edges shall bear on framing members or solid blocking.

D. Minimum Size Vertical Panel: 16 inches wide.

E. Minimum Size Horizontal Panel: 24 inches wide.

F. Oriented Strand Board not permitted for shear panels unless indicated on structural drawings.

3.4 FOUNDATION FRAMING, PLATES, SILLS AND SLEEPERS

A. Preservative treated wood required. Set wood sills on a bead of continuous butyl sealant on both sides of sill.

B. Under-Floor Clearance for Joist: 18 inches minimum.

C. Under-Floor Clearance for Girders: 12 inches minimum.

D. End Clearance for Lumber Entering Concrete: 1/2 inch minimum.

3.5 HORIZONTAL FRAMING

A. Bearing: 1-1/2 inch minimum on wood or metal, 3 inches on masonry. Lay framing members with crown up. Members with knots at bottom not permitted.

B. Lateral Support: Use solid blocking, cross bridging or other approved means.

C. Lap joists a minimum of 3 inches when framed from opposite sides of a beam. Do not run joists continuous beyond one span unless indicated otherwise on Drawings.

D. Openings: Double joists required for trimmer and headers for openings 4 ft. or larger unless indicated otherwise on Drawings.

E. Provide ties, purlins and blocking in conformance with Sections 2308.8.5 CBC.

F. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.6 TRELLIS INSTALLATION

A. Trellis, Post, Beams and Rafter shall be level, plumb and true and shall rest on brackets of a bearing point free from racking.

3.7 INSTALLATION OF BACKBOARDS

A. Install plywood backing panels as indicated on Drawings to support telephone and electrical equipment, data equipment, fixed equipment, cabinets, grab bars, door stops and plates. Fasten securely to framing. Ensure that backing panels are installed with good side out (whose face side is free of blemishes) side by side, no mix of sides permitted.

B. Install to extent indicated on the drawings or as required for electrical or communication system installation.

C. Install with sheet metal screws, No.10 minimum, at 12 inches on center minimum. Drywall screws will not be permitted.

D. Prime paint exposed faces. Do not cover manufacturer’s trade stamps indicating fire treatment.

E. Final finish: paint per Section 09 90 00, Painting.

END OF SECTION 06 10 00

SECTION 06 20 13 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior wood trim.

PART 2 - PRODUCTS

2.01 EXTERIOR TRIM

A. Lumber Trim for Painted Finish:
   1. Species and Grade: Western red cedar; NLGA, WCLIB, or WWPA Grade B.
   2. Maximum Moisture Content: 19 percent with at least 85 percent of shipment at 12 percent or less.
   3. Face Surface: Surfaced (smooth).

2.02 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
   1. For redwood, provide stainless steel fasteners.

B. Flashing: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed.
   1. Cut to required lengths and prime ends.
   2. Comply with requirements in Section 09 91 13 "Exterior Painting."

3.02 INSTALLATION, GENERAL

A. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.
   1. Use concealed shims where necessary for alignment.
   2. Scribe and cut exterior finish carpentry to fit adjoining work.
   3. Refinish and seal cuts as recommended by manufacturer.

4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.03 STANDING AND RUNNING TRIM INSTALLATION

A. Install flat-grain lumber with bark side exposed to weather.

B. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary.
1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water.
1. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint.
2. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

END OF SECTION

SECTION 07 01 50.19 PREPARATION FOR REROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Full tear-off of entire roof system.
2. Removal of flashings and counterflashings.
3. Temporary roofing.

1.02 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:
a. Reroofing preparation, including roofing system manufacturer's written instructions.
b. Temporary protection requirements for existing roofing system components that are to remain.
c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
e. Existing roof deck conditions requiring Architect notification.
f. Existing roof deck removal procedures and Owner notifications.
g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
h. Structural loading limitations of roof deck during reroofing.
i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
j. HVAC shutdown and sealing of air intakes.
k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
l. Asbestos removal and discovery of asbestos-containing materials.
m. Governing regulations and requirements for insurance and certificates if applicable.
n. Existing conditions that may require Architect notification before proceeding.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Temporary Roofing Submittal: Product data and description of temporary roofing system.

1.04 INFORMATIONAL SUBMITTALS

A. Field Test Reports:
1. Fastener pull-out test report.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with governing EPA notification regulations before beginning roofing removal.
2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Existing Roofing System: Built-up asphalt roofing.

B. Owner will occupy portions of building immediately below reroofing area.
1. Conduct reroofing so Owner's operations are not disrupted.
2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
1. Remove only as much roofing in one day as can be made watertight in the same day.

G. Hazardous Materials: A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
   1. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.

PART 2 - PRODUCTS

2.01 TEMPORARY ROOFING MATERIALS

A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

2.02 INFILL AND REPLACEMENT MATERIALS

A. Use infill materials matching existing roofing system materials unless otherwise indicated.

B. Wood blocking, curbs, and nailers are specified in Section 06 10 00 "Rough Carpentry."

C. Plywood roof sheathing is specified in Section 06 16 00 "Sheathing."

D. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed in FM Approvals' RoofNav, and acceptable to new roofing system manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection of In-Place Conditions:
   1. Protect existing roofing system that is not to be reroofed.
   2. Loosely lay 1-inch- minimum thick, EPS insulation over existing roofing in areas not to be reroofed.
      a. Loosely lay 15/32-inch plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch.
   3. Limit traffic and material storage to areas of existing roofing that have been protected.
   4. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
   5. Comply with requirements of existing roof system manufacturer's warranty requirements.

B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.

C. Shut off rooftop utilities and service piping before beginning the Work.

D. Test existing roof drains to verify that they are not blocked or restricted.
   1. Immediately notify Architect of any blockages or restrictions.

E. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
   1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

F. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

G. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
   1. Prevent debris from entering or blocking roof drains and conductors.
      a. Use roof-drain plugs specifically designed for this purpose.
      b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
   2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
      a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.02 ROOF TEAR-OFF

A. Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing roof deck.
   1. Remove base flashings and counter flashings.
   2. Remove perimeter edge flashing and gravel stops.
   3. Remove copings.
   4. Remove expansion-joint covers.
   5. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
   6. Remove roof drains indicated on Drawings to be removed.
   7. Remove wood blocking, curbs, and nailers.
   8. Remove fasteners from deck or cut fasteners off slightly above deck surface.

3.03 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.
   1. Do not proceed with installation until directed by Architect.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
   1. Do not proceed with installation until directed by Architect.

D. Provide additional deck securement as indicated on Drawings.

E. Prepare and paint steel deck surface.
   1. Painting and preparation for painting is specified in Section 09 91 13 "Exterior Painting."

F. Replace plywood roof sheathing as indicated on Drawings.

G. Replace plywood roof sheathing as directed by Architect.
   1. Roof sheathing replacement will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

3.04 INFILL MATERIALS INSTALLATION

A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.
   1. Installation of infill materials is specified in [**Section 07 51 13 "Built-up Asphalt Roofing."**] [**Section 07 51 16 "Built-up Coal Tar Roofing."**] [**Section 07 52 13 "Atactic-Polypropylene (APP) Modified Bituminous Membrane Roofing."**] [**Section 07 52 16 "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing."**] [**Section 07 53 16 "Chlorosulfonate-Polyethylene (CSPE) Roofing."**] [**Section 07 53 23 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing."**] [**Section 07 54 16 "Keytone Ethylene Ester (KEE) Roofing."**] [**Section 07 54 19 "Polyvinyl-Chloride (PVC) Roofing."**] [**Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing."**]
   2. Installation of wood blocking, curbs, and nailers is specified in [**Section 06 10 00 "Rough Carpentry."**] [**Section 06 10 53 Miscellaneous Rough Carpentry."**]

B. Install new roofing patch over roof infill area.
   1. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.05 TEMPORARY ROOFING

A. Install approved temporary roofing over area to be reroofed.

B. Install temporary roofing over area to be reroofed.

1. [**Install two glass-fiber felts**] [**Mechanically fasten base sheet and install a glass-fiber felt**], lapping each sheet 19 inches over preceding sheet.
2. Embed glass-fiber felt in a solid mopping of hot roofing asphalt applied within equiviscous temperature range.
3. Glaze-coat completed surface with hot roofing asphalt.

C. Remove temporary roofing before installing new roofing.

D. Prepare temporary roof to receive new roofing [**according to approved temporary roofing proposal**] [**by patching and repairing temporary roofing**] <**Insert preparation method**>.
1. Restore temporary roofing to watertight condition.
2. Obtain approval for temporary roof substrate from roofing manufacturer and Architect before installing new roof.

3.06 ROOF RE-COVER PREPARATION

A. Remove blisters, ridges, buckles,[**mechanically attached roofing fastener buttons projecting above roofing,**] and other substrate irregularities from existing roofing that inhibit new recover boards from conforming to substrate.
1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Scarify surface of sprayed polyurethane foam as necessary to achieve a sufficiently uniform plane to receive new recover boards.
3. Broom clean existing substrate.
4. Coordinate with Owner's inspector to schedule times for tests and inspections.
5. Verify that existing substrate is dry.
    a. Spot check substrates with an electrical capacitance moisture-detection meter.
6. Remove materials that are wet or damp.
    a. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

B. Remove blisters, ridges, buckles,[**mechanically attached roofing fastener buttons projecting above roofing,**] and other substrate irregularities from existing roofing that inhibit new [**recover boards**] [**roofing**] from conforming to substrate.
1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Shave surface of sprayed polyurethane foam as necessary to achieve a sufficiently uniform plane to receive new [**recover boards**] [**roofing**].
3. Broom clean existing substrate.
4. Coordinate with Owner's inspector to schedule times for tests and inspections.
5. Verify that existing substrate is dry before proceeding with installation.
    a. Spot check substrates with an electrical capacitance moisture-detection meter.
6. Remove materials that are wet and damp.

a. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

C. Remove blisters and areas of roofing not fully adhered.

D. Remove[**mechanically attached roofing fastener buttons projecting above roofing and other**] substrate irregularities that inhibit new recover boards from conforming to substrate.
1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Clean substrate of contaminants, such as dirt, debris, oil, and grease, that can affect adhesion of coated foamed roofing.
3. Power vacuum the existing roof surface.
   a. If recommended by foam manufacturer, prime dried surface at recommended rate with recommended primer.
4. Scarify surface of coated polyurethane roofing as necessary to achieve a suitable substrate for new roofing.
5. Provide additional uplift securement for existing roofing system with new screws and plates applied to each roof zone at the following densities:
   a. Field of roof, one fastener for each <**Insert area**>.
   b. Corners of roof, one fastener for each <**Insert area**>.
   c. Perimeters of roof, one fastener for each <**Insert area**>. Width of perimeter zone of roof is <**Insert dimension**>.
6. Verify that surface is dry by pressing litmus paper to surface areas most likely to retain moisture, such as shaded areas and low spots.
   a. If paper changes color, surface is too wet to apply foam.
7. Build up isolated low spots on existing roofing with sprayed foam specified in Section 07 57 00 "Coated Foamed Roofing" to prevent ponding.

3.07 BASE FLASHING REMOVAL

A. Remove existing base flashings.
1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain.
1. Replace metal counterflashings damaged during removal with counterflashings [**of same metal, weight or thickness, and finish as existing.**] [**specified in Section 07 62 00 "Sheet Metal Flashing and Trim."**] [**specified in Section 07 71 00 "Roof Specialties."**]

C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.
1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

D. Remove existing parapet sheathing and replace with new parapet sheathing to comply with Section 06 16 00 "Sheathing."
   1. If parapet framing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

E. When directed by Architect, replace parapet framing, wood blocking, curbs, and nailers to comply with [**Section 05 40 00 "Cold-Formed Metal Framing."**] [**Section 06 10 00 "Rough Carpentry."**] [**Section 06 10 53 Miscellaneous Rough Carpentry."**]

3.08 FASTENER PULL-OUT TESTING

A. [**Perform**] [**Retain independent testing and inspecting agency to conduct**] fastener pull-out tests according to SPRI FX-1, and submit test report to [**Architect**] [**and**] [**roofing manufacturer**] before installing new roofing system.
   1. Obtain [**Architect's**] [**roofing manufacturer's**] approval to proceed with specified fastening pattern.
      a. [**Architect**] [**Roofing manufacturer**] may furnish revised fastening pattern commensurate with pull-out test results.

3.09 DISPOSAL

A. Collect demolished materials and place in containers.
   1. Promptly dispose of demolished materials.
   2. Do not allow demolished materials to accumulate on-site.
   3. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Self-adhering weather barriers.

1.02 DEFINITIONS

A. Weather Barrier: Material within the exterior envelope assembly that performs as a water-resistive and air barrier, primarily to mitigate the consequences of bulk water intrusion through cladding systems and air movement through assemblies.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by weather barrier system manufacturer to install manufacturer's product.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Weather barrier shall be capable of performing as a continuous barrier to air, water, and perform as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Weather barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Self-Adhering Flexible Flashing Performance: Self-adhering flexible flashing shall meet minimum performance requirements when tested according to AAMA 711.

C. Fluid-Applied Flashing Performance: Fluid-applied flashing shall meet minimum performance requirements when tested according to AAMA 714.

2.02 SELF-ADHERING POLYPROPYLENE SHEET WEATHER BARRIERS

A. Self-Adhering, Multi-Layer, Vapor-Permeable Polypropylene Sheet: Self-adhering sheet consisting of multiple layers of spun-bonded polypropylene fabric with full surface coating of pressure sensitive adhesive with release liner on adhesive side.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dorken; Delta-Vent SA.
   b. Vaproshield; Wrapshield SA.
   c. GCP Applied Technologies; Perm-A-Barrier VPS.

B. Detailing Accessories: Self-adhering membranes, liquid flashing membranes, and sealants recommended by manufacturer for sealing joints and penetrations in weather barrier.

2.03 ACCESSORY MATERIALS

A. General: Accessory materials recommended by weather barrier manufacturer to produce a complete weather barrier assembly and compatible with weather barrier membrane.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

3.02 SELF-ADHERING WEATHER BARRIER INSTALLATION

A. Apply primer to substrates when required by weather barrier manufacturer in accordance with manufacturer's instructions.

B. Apply and firmly adhere sheets horizontally over area to receive weather barrier. Accurately align sheets and maintain uniform minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
   1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
   2. Roll sheets firmly to enhance adhesion to substrate.

C. Install weather barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air and weather barrier.

D. Correct deficiencies in or remove weather barrier that does not comply with requirements; repair substrates and reapply weather barrier components.

3.03 FIELD QUALITY CONTROL

A. Repair or remove and replace components of weather barrier system where inspections indicate that they do not comply with specified requirements.

3.04 CLEANING AND PROTECTION

A. Protect weather barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

END OF SECTION

SECTION 07 54 19 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Polyvinyl-chloride roofing membrane assembly including the following:
   1. Adhered polyvinyl chloride (PVC) roofing system.
   2. Air barrier / vapor retarder.
   3. Roof insulation.
   4. Cover board.
   5. Walkways.

B. Related Sections:
   1. Division 01 sustainable design requirements Section(s) for supplementary sustainable design criteria.
   2. Division 06 Sections for wood nailers, curbs, and blocking.
   3. Division 06 Sections for wood-based, structural-use roof deck panels.
   4. Division 22 Sections for roof drains.

1.02 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect,Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.

7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
1. Layout and thickness of insulation.
2. Flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.05 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittals:
1. Documentation for adhesives, indicating VOC content.
2. Documentation indicating roofing complies with solar reflectance requirements.

B. Manufacturer Certificates:
1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
a. Submit evidence of compliance with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Field Test Reports:
1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.09 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, air barrier / vapor retarder, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SUSTAINABLE DESIGN CRITERIA

A. Sustainable Design Criteria: Comply with indicated criteria for the following product categories:
   1. Adhesives:
      a. VOC content limits for field applications.
   2. Sealants:
      a. VOC content limits for field applications.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
   1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
   2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
   1. Building 9A:
      a. Zone 1' (Center Roof Area Field): 31 lbf/sq. ft.
      b. Zone 1 (Roof Area Field): 53 lbf/sq. ft.
      c. Zone 2 (Roof Area Perimeter): 70 lbf/sq. ft.
         1) Location: From roof edge to 0.6h inside roof edge.
      d. Zone 3 (Roof Area Corners): 95 lbf/sq. ft.
         1) Location: 0.2h deep by 0.6h long in each direction from building corner.
   2. All Other Buildings:
      a. Zone 1' (Center Roof Area Field): 28 lbf/sq. ft.
      b. Zone 1 (Roof Area Field): 49 lbf/sq. ft.
      c. Zone 2 (Roof Area Perimeter): 65 lbf/sq. ft.

1) Location: From roof edge to 0.6h inside roof edge.

d. Zone 3 (Roof Area Corners): 88 lbf/sq. ft.

1) Location: 0.2h deep by 0.6h long in each direction from building corner.

D. Solar Reflectance Index: Not less than 75 when calculated according to ASTM E1980, based on testing identical products by a qualified testing agency.

E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.03 POLYVINYL CHLORIDE (PVC) ROOFING

A. PVC Sheet: ASTM D4434/D4434M, Type II, glass-fiber reinforced, felt backed.

1. Manufacturers: Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
   a. Sika Sarnafil G410.
2. Thickness: 60 mils.
3. Exposed Face Color: White.

B. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.04 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced PVC sheet flashing, 55 mils thick, minimum, of same color as PVC sheet.

C. PVC-Coated Sheet Metal Flashing: Manufacturer's standard unreinforced PVC-coated, galvanized steel sheet flashing, 0,024 inch thick, of same color as PVC sheet.

D. Liquid-Applied Flashing: Manufacturer's standard reinforced flashing, 80 mils thick, minimum.

E. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

F. Bonding Adhesive: Manufacturer's standard.

G. Vented Base Sheet: ASTM D4897/D4897M, Type II; nonperforated, asphalt-impregnated fiberglass reinforced, with mineral granular patterned surfacing on bottom surface.

H. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

J. Miscellaneous Accessories: Provide preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.05 AIR BARRIER / VAPOR RETARDER

A. Sheet Air Barrier / Vapor Retarder: Manufacturer's recommended sheet product, minimum 15-mil-total thickness; self-adhering, cold adhesive applied, or torch applied, with slip-resisting surface compatible with adhered insulation and release paper backing. Provide primer when recommended by manufacturer.
   1. Mastic: Type recommended by manufacturer for sealing around penetrations and at terminations in air barrier / vapor retarder.

2.06 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   1. Compressive Strength: 20 psi minimum.

C. Tapered Insulation: Provide factory-tapered insulation boards.
   1. Material: Match roof insulation.
   2. Minimum Thickness: 1/4 inch.
   3. Slope:
      a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
      b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.07 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Modified asphaltic, asbestos-free, cold-applied adhesive.
   2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
   3. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

D. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.
   1. Thickness: 1/2 inch.
   2. Surface Finish: Factory primed or unprimed as recommended by roofing membrane manufacturer.

2.08 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
   4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than [75] <Insert number> percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
      a. Test Frequency: One test probe per each [1000 sq. ft.] <Insert area>, or portion thereof, of roof deck, with not less than three tests probes.
      b. Submit test reports within 24 hours after performing tests.
   6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.
8. Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.
9. Verify any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
10. Verify adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
1. Submit test result within 24 hours after performing tests.
a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.03 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, SPRI's Directory of Roof Assemblies listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

3.04 INSTALLATION OF AIR BARRIER / VAPOR RETARDER

A. Self-Adhering-Sheet: Prime substrate if required by manufacturer. Install sheet over area to receive air barrier / vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.
   1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
   2. Seal laps by rolling.

B. Completely seal air barrier / vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.05 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Wood Decking:
   1. Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows.
      a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
      b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
      c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
         1) Trim insulation so that water flow is unrestricted.
      d. Fill gaps exceeding 1/4 inch with insulation.
      e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
      f. Loosely lay base layer of insulation units over substrate.
   2. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks.
      a. Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
      b. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
   3. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
      a. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.

b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
    1) Trim insulation so that water flow is unrestricted.
e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
g. Loosely lay each layer of insulation units over substrate.
h. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

D. Installation Over Concrete Decks:
1. Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows.
    a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
        1) Trim insulation so that water flow is unrestricted.
    e. Fill gaps exceeding 1/4 inch with insulation.
    f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
    g. Loosely lay base layer of insulation units over substrate.
    h. Adhere base layer of insulation to vapor retarder according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
        1) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
    a. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.

b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
    1) Trim insulation so that water flow is unrestricted.
e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
g. Loosely lay each layer of insulation units over substrate.
h. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.06 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.
    a. Trim cover board so that water flow is unrestricted.
3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Loosely lay cover board over substrate.
5. Adhere cover board to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.07 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.

G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

H. Apply roof membrane with side laps shingled with slope of roof deck where possible.

I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.08 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.09 INSTALLATION OF WALKWAYS

A. Flexible Walkways:
   1. Install flexible walkways at the following locations:
      a. Retain one or more subparagraphs below. Revise to suit Project.
      b. Perimeter of each rooftop unit.
      c. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
      d. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
      e. Top and bottom of each roof access ladder.
      f. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
      g. Locations indicated on Drawings.
      h. As required by roof membrane manufacturer's warranty requirements.
   2. Provide 6-inch clearance between adjoining pads.
   3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

B. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 60 00 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Manufactured Products:
      a. Manufactured reglets and counterflashing.
   2. Formed Products:
      a. Formed sheet metal fabrications.
   3. Flexible flashing.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation layouts of flashing and sheet metal, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
   1. Include details for forming, joining, supporting, and securing flashing and sheet metal, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.
   2. Include identification of material, thickness, weight, and finish for each item.

C. Samples: For each exposed product and for each finish specified.

1.03 INFORMATIONAL SUBMITTALS

A. Maintenance data.

1.04 QUALITY ASSURANCE

A. Flashing and Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

B. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Flexible Flashing Performance, General: Flexible flashing seals with adjacent construction shall be capable of performing as a continuous air and water barrier. Flexible flashing shall be capable of accommodating substrate movement, construction material changes, penetrations, and transitions without deterioration, water penetration under pressure differential, and air leakage exceeding specified limits.

B. Self-Adhering Flexible Flashing Performance: Self-adhering flexible flashing shall meet minimum performance requirements when tested according to AAMA 711.

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
   2. Exposed Finish: Fluoropolymer.

2.03 FLEXIBLE FLASHING

A. Self-Adhering Flexible Flashing: SBS-modified bituminous sheet membrane, 30 mil minimum thickness, laminated to a cross-laminated polyethylene film, in factory cut widths.
   1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. W.R. Grace & Company; Perm-A-Barrier Wall Flashing.
      b. Henry; Blueskin SA.
   2. Locations: Transition flashing at sheathing, metal flashings, and other locations indicated.

B. High Temperature Self-Adhering Membrane Flashing: SBS-modified or butyl based bituminous sheet membrane, 30-40 mil thickness, laminated to a cross-laminated polyethylene film, in factory cut widths. One of the following:
   1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. "Sill Pan Flash Butyl"; Protecto Wrap.
      b. "FortiFlash Butyl Waterproof Flashing Membrane"; Henry.
      c. "Waterblock HT"; International Building Components, Inc.
   2. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.

3. Locations: Beneath metal copings, metal plate assemblies, and other locations indicated.

C. Liquid Mastic: Liquid mastic recommended by flashing manufacturer.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete flashing and sheet metal installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. Fasteners for Metallic-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in flashing and sheet metal and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.05 REGLETS

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Cheney Flashing Company.
b. Fry Reglet Corporation.
c. Heckmann Building Products Inc.
d. Hickman, W. P. Company.
e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.

f. Keystone Flashing Company, Inc.
g. National Sheet Metal Systems, Inc.
h. Sandell Manufacturing Company, Inc.

3. Material: Galvanized steel, 0.022 inch thick.
4. Finish: With manufacturer's standard color coating.

2.06 FABRICATION, GENERAL

A. General: Custom fabricate flashing and sheet metal to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
1. Obtain field measurements for accurate fit before shop fabrication.
2. Form flashing and sheet metal without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

C. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

2.07 SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
1. Expansion Joints: Butt type with cover plate.
2. Accessories: Wire ball downspout strainer.
3. Gutters with Girth up to 15 Inches: Fabricate from the following materials:

a. Galvanized Steel: 0.022 inch thick.

4. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:
   a. Galvanized Steel: 0.028 inch thick.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Fabricate from the following materials:
      a. Galvanized Steel: 0.022 inch thick.

C. Counterflashing and Flashing Receivers: Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. General: Anchor flashing and sheet metal and other components of the Work securely in place, with provisions for thermal and structural movement so that completed flashing and sheet metal shall not rattle, leak, or loosen, and shall remain watertight. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete flashing and sheet metal system.
   1. Install flashing and sheet metal true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install flashing and sheet metal to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
   4. Install exposed flashing and sheet metal without excessive oil canning, buckling, and tool marks.
   5. Install sealant tape where indicated.
   6. Torch cutting of flashing and sheet metal is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Seal joints as shown and as required for watertight construction.

3.02 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
   1. Clean, prepare, prime, and treat substrates according to manufacturer's written instructions.
   2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
   3. Apply in a shingled manner to shed water without interception by any exposed sheet edges.
   4. Roll firmly to enhance adhesion to substrates.

3.03 SHEET METAL FLASHING INSTALLATION

A. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
   1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

B. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.04 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Remove temporary protective coverings and strippable films as flashing and sheet metal are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Sealant and backing materials.

B. Related Sections:
   1. Division 01 sustainable design requirements Section(s) for supplementary sustainable design criteria.

1.02 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

1.03 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittals:
   1. Documentation for sealants, indicating VOC content.

B. Sample Warranties: For special warranties.

1.04 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
   3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with masonry substrates.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
   6. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

1.05 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.06 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period:
      a. Silicone Sealants: 20 years from date of Substantial Completion.
      b. All Other Sealants: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SUSTAINABLE DESIGN CRITERIA

A. Sustainable Design Criteria: Comply with indicated criteria for the following product categories:
   1. Sealants:
      a. VOC content limits for field applications.

2.02 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.03 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.04 JOINT SEALANTS

A. Silicone: Single-component, nonsag, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
   1. Joint Locations: Exterior joints in vertical surfaces and horizontal nontraffic surfaces, and as follows:
      a. Joints in cement plaster.
      b. Perimeter joints between materials listed above and frames of doorswindows and louvers.
      c. Control and expansion joints in ceilings and other overhead surfaces.
      d. Other joints as indicated on Drawings.
   2. Basis-of-Design Product: The Dow Chemical Company; DowSil 790, 791, or 795 at Contractor's option.
      a. Subject to compliance with requirements, manufacturers offering comparable products that may be incorporated into the Work include, but are not limited to, the following:
         1) GE Construction Sealants; Momentive Performance Materials Inc.
         2) Pecora Corporation.
         3) Sika Corporation; Joint Sealants.
         4) Tremco Incorporated.

B. Silicone: Single-component, nonsag, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Joint Locations: Sealant joints in contact with weather barrier, weather barrier flashing materials, and as follows:
      a. Perimeter joints between materials listed above and frames of doorswindows and louvers.
   2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
      a. The Dow Chemical Company; DowSil 758 Silicone Weather Barrier Sealant.
      b. Pecora Corporation; AVB Silicone.

2.05 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), unless otherwise recommended by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.06 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.03 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

SECTION 09 24 00 - PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior portland cement plaster (stucco).

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples : For each type of factory-prepared finish coat indicated.

1.03 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Zinc Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G60 zinc coating.

B. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
   1. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd..

C. Paper Backing: FS UU-B-790, Type I, Grade D, Style 2 vapor-permeable paper.
   1. Provide paper-backed lath unless otherwise indicated .

2.02 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
2. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
3. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
4. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
5. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
6. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
7. Two-Piece Expansion Joints: Fabricated from zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges.
8. Soffit Vents: Fabricated from zinc-coated (galvanized) steel; formed to produce 4 inch perforated vent in M-shaped configuration; with unperforated flanges.

2.03 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in portland cement plaster.

C. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

2.04 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

C. Sand Aggregate: ASTM C 897.

D. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Acrocrete, BASF Wall Systems, Inc.; Acrotex.
   b. California Stucco Products Corp.; Texture Flex.

c. Dryvit Systems, Inc.; Dryvit TAFS.
d. El Rey Stucco Company, Inc., a brand of ParexLaHabra, Inc.; Prema-Flex.
e. Finestone, BASF Wall Systems, Inc.; PebbleTex.
f. LaHabra, a brand of ParexLaHabra, Inc.; Acrylic Finish.
g. Master Wall Inc.; Superior Finishes.
h. Omega Products International, Inc.; Omega Flex Finishes.
i. Parex, Inc., a brand of ParexLaHabra, Inc.; e-lastic.
j. Pleko Group LLC Products, Inc.; Pleko Structure Finishes.
k. Senergy, BASF Wall Systems, Inc.; Senerflex.
l. Shamrock Stucco LLC; Stucco Acrylic Finish.
m. Sto Corp.; Powerwall Finish.
n. Stuc-O-Flex International, Inc.; Elastomeric Finish
o. Surewall, a brand of ParexLaHabra, Inc.; Acrylic Finish.
p. SonoWall, BASF Wall Systems, Inc.; StuccoTex Finish.

2. Color: Match existing.

2.05 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.
1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
1. Portland Cement Mixes:
a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.02 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.

3.03 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:
   1. Install lath-type, external-corner reinforcement at exterior locations.
   2. Install cornerbead at exterior locations.

C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:
   1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      a. Vertical Surfaces: 144 sq. ft.
      b. Horizontal and other Nonvertical Surfaces: 100 sq. ft.
   2. At distances between control joints of not greater than 18 feet o.c.
   3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
   4. Where control joints occur in surface of construction directly behind plaster.
   5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.04 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

B. Walls; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4-inch thickness.
   1. Portland cement mixes.

C. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; ; 3/4-inch (19-mm) thickness.
   1. Portland cement mixes.

D. Plaster Finish Coats: Apply to provide finish to match existing.

E. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

F. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.

3.05 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Primers.
   2. Finish coatings.

B. Related Sections:
   1. Division 01 sustainable design requirements Section(s) for supplementary sustainable design criteria.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include preparation requirements and application instructions.
   2. Indicate VOC content.

B. Samples: For each type of topcoat product.

1.03 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittals:
   1. Documentation for paints and coatings, indicating VOC content.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.05 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 3 articles for the paint category indicated.

B. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.02 SUSTAINABLE DESIGN CRITERIA

A. Sustainable Design Criteria: Comply with indicated criteria for the following product categories:
   1. Paints and Coatings:
      a. VOC content limits for field applications.

2.03 PAINT PRODUCTS, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

B. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Wood: 15 percent.

3.02 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.

D. Wood Substrates:
   1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
   2. Sand surfaces that will be exposed to view, and remove sanding dust.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.03 APPLICATION

A. Apply paints in accordance with manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
   1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
   2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
   3. Allow empty paint cans to dry before disposal.
   4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.05 EXTERIOR PAINTING SCHEDULE

A. Wood Siding and Trim; Acrylic latex. Provide one of the following systems:
   1. Benjamin Moore:
      a. Primer: As recommended by manufacturer for substrate and required topcoat.
      b. Intermediate Coat: Same as topcoat.
      c. Top Coat: Regal Select Exterior Moorglo Soft Gloss.
      d. Sheen: Semi-Gloss.
   2. Sherwin Williams:
      a. Primer: As recommended by manufacturer for substrate and required topcoat.
      b. Intermediate Coat: Same as topcoat.
      c. Top Coat: Pro Industrial Waterbased Alkyd Urethane.
      d. Sheen: Semi-Gloss.

END OF SECTION

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Toilet and shower compartments configured as toilet and shower enclosures and urinal screens of the following type:
      a. Solid-plastic.

B. Related Sections:
   1. Section 10 28 13 "Toilet Accessories" for toilet accessories mounted on toilet compartments.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.04 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and California Building Code, Chapter 11B for toilet compartments designated as accessible.

B. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

2.02 SOLID-PLASTIC TOILET AND SHOWER COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Accurate Partitions Corporation.
   2. Ampco, Inc.
   3. Bradley Corporation; Mills Partitions.
   4. Hadrian Manufacturing Inc.
   5. Partitions Systems Incorporated.
   6. Scranton Products.
   7. Weis-/Robart Partitions/Penner Partitions Inc.

B. Toilet-Enclosure Style: Floor anchored.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
   1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
   2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
   3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.

E. Pilaster Shoes: Manufacturer's standard design; stainless steel.
   1. Polymer Color and Pattern: Matching pilaster.

F. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum.

2.03 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
   1. Hinges: Manufacturer's minimum 0.062-inch- thick, stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
   2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.

3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at out-swinging doors. Mount with through-bolts.
5. Door Pull: Manufacturer's heavy-duty cast stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.04 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221.

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

2.05 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories, and solid blocking within panel where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
   1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Coordinate layout and installation of supports, inserts, and anchors built into other units of work for toilet compartment anchorage.

3.02 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position indicated with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch.
      b. Panels and Walls: 1 inch.
   2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
      a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.03 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 10 28 00 - TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Washroom accessories.

1.02 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1.04 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
   1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.02 WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. ASI-American Specialties, Inc.
   2. Bobrick Washroom Equipment, Inc.
   3. Bradley Corporation.
   4. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.

B. Toilet Tissue (Roll) Dispenser:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-2888.
   2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
   3. Mounting: Surface mounted.
   4. Operation: Noncontrol delivery with theft-resistant spindle.
   5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Grab Bar:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-6806 Series.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin).
   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length: As indicated on Drawings.

D. Ambulatory Stall Grab Bar:
   1. Basis-of-Design Product: Bradley; 802 Series.
   2. Toilet Compartment Mounting: Bradley Series 899-011.
   3. Material: Stainless steel, 0.05 inch thick.

E. Sanitary-Napkin Disposal Unit:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-254.
   2. Mounting: Surface mounted.
   3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
   4. Receptacle: Removable.
   5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

F. Seat-Cover Dispenser:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-221.
   2. Mounting: Surface mounted.
   3. Minimum Capacity: 250 seat covers.
   4. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
   5. Lockset: Tumbler type.

2.03 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to comply with specified structural-performance requirements.

3.02 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.02 SUMMARY

A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.04 SUBMITTALS

A. Product Data: For the following:
1. Transition fittings.

2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.05 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.07 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section 08 31 13 "Access Doors and Frames."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8-inch-thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.04 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
1. Available Manufacturers:
   a. Cascade Waterworks Mfg. Co.
   b. Dresser Industries, Inc.; DMD Div.
   c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.

d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.

2.05 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
1. Available Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
1. Available Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Available Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:
   a. Calpico, Inc.
   b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
1. Available Manufacturers:
   a. Perfection Corp.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Co., Inc.
   d. Victaulic Co. of America.

2.06 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Manufacturers:
   a. Thunderline Link Seal
   b. Calpico, Inc.
   c. Metraflex Co.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.07 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

E. Underdeck Clamp: Clamping ring with set screws.

F. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.08 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

D. Finish: Polished chrome plated.

E. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

F. Finish: Polished chrome plated.

G. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

H. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

I. One-Piece, Floor-Plate Type: Cast-iron floor plate.

J. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel

removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
   1. New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type with spring clips.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
      f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
      i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-

iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
   c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      1) Seal space outside of sleeve fittings with grout.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe handling practice of cleaners, primers, and solvent cements.
   2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
   3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
   4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   5. PVC No pressure Piping: Join according to ASTM D 2855.
   6. PVC to ABS No pressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic No pressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.03 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.05 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.06 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

3.07 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

END OF SECTION

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Hangers and supports for plumbing piping and equipment consists of furnishing transportation, labor, materials and equipment to furnish and install the following:
   1. Steel pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Metal framing systems.
   4. Thermal-hanger shield inserts.
   5. Fastener systems.
   6. Pipe stands.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:
   1. Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
   2. Division 22 Section "Noise, Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.03 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.05 SUBMITTALS

A. Product Data: For the following:
   1. Steel pipe hangers and supports.
   2. Thermal-hanger shield inserts.
   3. Powder-actuated fastener systems.
   4. Pipe positioning systems.

B. Welding certificates.

1.06 QUALITY ASSURANCE

A. Welding: Welding shall be performed only by qualified welders, and shall comply with ASME Boiler Construction Code, ANSI Code and State of California requirements.

B. Codes and Standards:
   1. All governing codes, ordinances and agencies, in accordance with the provisions of Division 1 of these specifications.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:
   1. B-Line Systems, Inc.; a division of Cooper Industries.
   2. ERICO/Michigan Hanger Co.
   3. Hilti Inc.
   4. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.03 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:
1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Hilti Inc.
4. Tolco Inc.
5. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.05 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:
1. ERICO/Michigan Hanger Co.
2. Pipe Shields, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.06 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:
   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
   c. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
   a. B-Line Systems, Inc.; a division of Cooper Industries.
   b. Hilti, Inc.
   c. ITW Ramset/Red Head.
   d. Powers Fasteners.

2.07 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
1. Manufacturers:
   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.

C. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.08 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:
1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

2.09 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
   2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
   3. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
   4. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
   5. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
   6. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
   7. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
   8. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
   9. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
   10. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
   11. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
   12. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
   13. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to

NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.

14. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
15. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
16. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
9. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
10. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

11. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
12. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
13. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
14. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
    2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
    3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
    2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
    3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
    4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
    5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
    6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
    7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
    8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
        a. Horizontal (MSS Type 54): Mounted horizontally.
        b. Vertical (MSS Type 55): Mounted vertically.
        c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.02 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Pipe Stand Installation:
   1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
   2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand

and mount on permanent, stationary roof curb. Refer to Section "Roof Accessories" for curbs.

H. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

P. Insulated Piping: Comply with the following:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

Q. Horizontal Hanger Spacing in accordance with following minimum schedules (other spacings and rod sizes may be used in accordance with MSS SP-58 and the SMACNA Seismic Restraint Manual using a safety factor of five. Comply with more restrictive requirementsa of local codes where those exceed the following minmum:
1. Cast Iron:

CAST IRON PIPE SIZE	HANGER / SUPPORT SPACING (MAXIMUM)	ROD SIZE (MINIMUM)
Up to 4”	Each joint and 10 feet max	3/8”
Up to 8”	Each joint and 10 feet max	1/2”
Up to 12”	Each joint and 10 feet max	5/8”

2. Steel Pipe (Liquid Filled):

STEEL PIPE SIZE (LIQUID FILLED)	HANGER / SUPPORT SPACING (MAXIMUM)	ROD SIZE (MINIMUM)
Up to 1-1/4”	5 feet	3/8”
1-1/2” and 2”	7 feet	3/8”
2-1/2” to 4”	10 feet	1/2"
5” to 8”	10 feet	5/8”

3. Steel Pipe (Gas Filled tp ,eet pr exceed NFPA-54):

STEEL PIPE SIZE (GAS FILLED)	HANGER / SUPPORT SPACING (MAXIMUM)	ROD SIZE (MINIMUM)
1/2”	4 feet	3/8”
3/4” to 2”	6 feet	3/8”
2-1/2” to 4”	10 feet	1/2"
5” to 8”	10 feet	5/8”

4. Copper Pipe:

COPPER PIPE SIZE	HANGER / SUPPORT SPACING (MAXIMUM)	ROD SIZE (MINIMUM)
1/2”	4 feet	3/8”
3/4” to 2”	6 feet	3/8”
2-1/2” to 4”	8 feet	3/8"
5” to 8”	10 feet	1/2”

5. Glass Pipe:

GLASS PIPE SIZE	HANGER / SUPPORT SPACING (MAXIMUM)	ROD SIZE (MINIMUM)
Up to 2”	6 feet	3/8”
2-1/2” and 6”	8 feet	1/2”

6. Plastic/Fiberglass Pipe:

PLASTIC / FIBERGLASS PIPE SIZE	HANGER / SUPPORT SPACING (MAXIMUM)	ROD SIZE (MINIMUM)
Up to 1”	3 feet	3/8”
1-1/4” and 2-1/2”	4 feet	3/8”

3” to 8”	4 feet	1/2"

7. Caulked Bell & Spigot, including Glass Pipe, Additional Support Requirements:

    a. Provide hanger for each section of pipe, located at shoulder of bell. Where an excessive number of fittings are installed between hangers, provide additional reinforcing.

R. Vertical Support Spacing in accordnace with following minimum schedules:

1. Cast Iron:

Pipe Size	Vertical Support Spacing (Maximum)
All sizes	Base and each floor, not to exceed 15 feet

2. Steel Pipe (Water and Air Filled):

Pipe Size	Vertical Support Spacing (Maximum)
All sizes	Base and each floor, not to exceed 25 feet

3. Steel Pipe (Gas Filled tp ,eet pr exceed NFPA-54):

Pipe Size	Vertical Support Spacing (Maximum)
½”	6 feet
¾” to 1”	8 feet
1¼” and larger	Every floor level

4. Copper Pipe:

Pipe Size	Vertical Support Spacing (Maximum)
All sizes	Base and each floor, not to exceed 10 feet

5. Plastic/Fiberglass Pipe:

Pipe Size	Vertical Support Spacing (Maximum)
All sizes	Base and each floor, not to exceed 10 feet

3.04 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.06 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in 09

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 22 14 13 - STORM DRAINAGE PIPING

PART 1 -GENERAL

1.01 WORK INCLUDED

A. STORM DRAINAGE PIPING consists of furnishing transportation, labor, materials, and equipment to furnish and install the following storm drainage piping inside the building:
   1. Pipe, tube, and fittings.
   2. Special pipe fittings.

1.02 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 apply to this Section.

B. COMMON WORK RESULTS FOR PLUMBING - Section 22050

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM International)

B. Cast Iron Soil Pipe Institute (CISPI)

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

D. American Water Works Association (AWWA)

1.04 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:
   1. Storm Drainage Piping: 10-foot head of water.

B. Seismic Performance: Piping and support and installation shall be in conformance with the SMACNA Guidelines.

1.05 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

1.06 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Codes and Standards:
1. All governing Codes, Ordinances and Agencies, in accordance with the provisions of Division 1 of these specifications.

PART 2 -PRODUCTS

2.01 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:
1. Soil, waste, vent and storm drain piping to 5 feet outside building: Cast-iron soil pipe and fittings conforming to the requirements of CISPI Standard 301, ASTM A888 or ASTM A74 for all pipe and fittings. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer. Wrap all underground piping as specified in this Section.
a. Manufacturers:
1) Tyler Pipe
2) A.B. & I.
3) Charlotte Pipe and Foundry.

B. Shielded Couplings: ASTM C1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
1. Above Ground: Type 300 Series stainless steel, "No-Hub" standard duty, shielded couplings as approved by the Cast Iron Soil Pipe Institute, CISPI-310-85 with stainless steel corrugated shield, stainless steel bands and tightening devices and ASTM C564 rubber sleeve. Equivalent to Tyler.
2. Below Ground: Type 304 stainless steel, "No-Hub" by the Cast Iron Soil Pipe Institute, CISPI-310-85 with stainless steel shield, stainless steel band and tightening devices and ASTM C564 rubber sleeve. Equivalent to Husky HD-2000.
a. Manufacturers:
1) Clamp-All Corporation
2) Husky Technologies
3) Tyler Pipe; Soil Pipe Division
4) 2.02 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

C. Standard: ASTM A 674 or AWWA C105/A 21.5.

D. Material: Linear low-density polyethylene film of 0.008-inch minimum thickness.

E. Form: Sheet

F. Color: Black

2.02 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste,

and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40 will not be accepted.

D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.

E. PVC Pressure Fittings: ASTM D 2466, Socket Type

F. Primer: ASTM F 656
   1. Primer shall have a VOC content of 550g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
   2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers”

G. Solvent Cement: ASTM D2564
   1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
   2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.

2.03 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard ASTM A 674 or AWWA C105/A21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch minimum thickness manufactured of virgin polyethylene material conforming to the requirements of ASTM D 1248.

C. Form: Sheet.

D. Color: Black

E. Install polyethylene encasement for Hubless Service and extra heavy DWV cast iron pipe and fitting systems in accordance with ASTM A74, X3, and CISPI Handbook.

PART 3 -EXECUTION

3.01 EXCAVATION

A. Refer to EARTHWORK and TRENCHING AND BACKFILLING Sections for excavating,

trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Storm drainage piping inside building shall be hubless cast-iron soil pipe and fittings; standard-duty shielded, stainless-steel couplings; and hubless-coupling joints.

3.03 PIPING INSTALLATION

A. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Where soil is corrosive install 8 mil. polyethylene encasement on underground piping in conformance with ASTM A674 or AWWA C105/ANSI A21.5. Backfill with clean sand a minimum of 4 inches all around pipe and fittings.

B. Storm drainage piping outside the building downstream of point of connection (POC) are specified in civil drawings.

C. Basic piping installation requirements are specified in COMMON WORK RESULTS FOR PLUMBING Section 220500.

D. Install seismic restraints on piping. Seismic-restraint devices are specified in NOISE, VIBRATION AND SEISMIC CONTROLS OF PLUMBING PIPING AND EQUIPMENT Section 220548.

E. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in PLUMBING SPECIALTIES Section 221119.

F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in PLUMBING SPECIALTIES Section 221119.

G. Install wall-penetration fitting system at each service pipe penetration through foundation wall. Make installation watertight.

H. Install above ground PVC piping in accordance to ASTM D 2665.

I. Install under ground PVC piping in accordance to ASTM D 2321.

J. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by

authorities having jurisdiction.

3.04 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in COMMON WORK RESULTS FOR PLUMBING Section 220500.

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendices

3.05 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in NOISE, VIBRATION AND SEISMIC CONTROLS Section 220548.

B. Pipe hangers and supports are specified in HANGERS AND SUPPORTS Section 220529. Install the following:
1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet, if indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports in conformance with HANGERS AND SUPPORTS Section 220529.

D. Support vertical piping and tubing at base and at each floor.

E. Horizontal cast-iron no-hub piping: Provide hangers or supports at each side of a no-hub fitting.

F. Install hangers for cast-iron soil piping with maximum horizontal spacing and minimum rod diameter in accordance with the requirements of the California Plumbing Code.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions

H. For PVC – refer to spec section 22 13 13.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.07 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to the procedures of authorities having jurisdiction or, in absence of published procedures, in accordance with the requirements of the California Plumbing Code.

3.08 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

D. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 22 14 23 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Roof drains.
   2. Miscellaneous storm drainage piping specialties.
   3. Cleanouts.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.01 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains (RD/OD-1):
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Josam Company.
      b. Smith, Jay R. Mfg. Co.
      c. Zurn Industries, LLC.
      d. Or Equal.
   2. Standard: ASME A112.6.4, for general-purpose roof drains.
   3. Body Material: Cast iron.
   4. Dimension of Body: Nominal 14-inch diameter.
   5. Combination Flashing Ring and Gravel Stop: Required.
   6. Flow-Control Weirs: Required.
   7. Outlet: Bottom
   8. Extension Collars: Required.
   9. Underdeck Clamp: Required.
   10. Expansion Joint: Required.

11. Sump Receiver Plate: Required.
12. Dome Material: Cast iron.
13. Perforated Gravel Guard: Stainless steel.
14. Vandal-Proof Dome: Required.
15. Water Dam: 2 inches high

B. Cast-Iron, Medium-Sump, General-Purpose Roof Drains:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.
   c. Watts; a Watts Water Technologies company.
   d. Or Equal.
2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal **14-inch** diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Required.
7. Outlet: Bottom
8. Extension Collars: Required.
9. Underdeck Clamp: Required.
10. Expansion Joint: Required.
11. Sump Receiver Plate: Required.
12. Dome Material: Cast iron.
13. Perforated Gravel Guard: Stainless steel.
14. Vandal-Proof Dome: Required.
15. Water Dam: **2 inches** high

C. Cast-Iron, Medium-Sump, General-Purpose Downspout Adaptors:
1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
2. Size: Inlet size to match parapet drain outlet.

D. Downspout Boots:
1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; **NPS 4** outlet; and shop-applied bituminous coating.
2. Size: Inlet size to match downspout and NPS 4 outlet.

E. Conductor Nozzles:
1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

F. Downspout Covers:
1. Description: Stainless steel body with securing wall flange with mounting holes and vandal proof secured perforated stainless-steel hinged strainer.

2. Size: Same as connected conductor.

2.02 CLEANOUTS

A. Floor Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sioux Chief Manufacturing Company, Inc.
   b. Smith, Jay R. Mfg. Co.
   c. Zurn Industries, LLC.
   d. Or Equal.
2. Standard: ASME A112.36.2M, for adjustable housing cleanouts.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule Material: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Spigot.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Polished bronze.
11. Frame and Cover Shape: Round.
12. Top-Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to clean out.

B. Test Tees:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.
   c. Watts; a Watts Water Technologies company.
   d. Or Equal.
2. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
3. Size: Same as connected drainage piping.
4. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure Plug: Raised head, brass.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

C. Wall Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.
   c. Zurn Industries, LLC.

d. Or Equal.

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
3. Size: Same as connected drainage piping.
4. Body Material: [Hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, [flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
   1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
   2. Install expansion joints, if indicated, in roof drain outlets.
   3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install downspout boots at grade with top 9 inches above grade. Secure to building wall.

D. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

E. Install downspout covers through wall on bottom of conductors at 9 inches above grade. Secure to building wall and conductors.

F. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:
   1. Use cleanouts the same size as drainage piping up to **NPS 4**. Use **NPS 4** for larger drainage piping unless larger cleanout is indicated.
   2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
   3. Locate cleanouts at minimum intervals of **50 feet** for piping **NPS 4** and smaller and **100 feet** for larger piping.
   4. Locate cleanouts at base of each vertical storm stack.

G. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

H. For cleanouts located in concealed piping, install cleanout wall access covers, of types

indicated, with frame and cover flush with finished wall.

I. Install horizontal backwater valves in floor with cover flush with floor.

J. Install drain-outlet backwater valves in outlet of drains.

K. Install test tees in vertical conductors and near floor.

L. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

M. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.

N. Assemble channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

O. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.02 3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 14 13 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.03 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Plumbing fixtures consists of furnishing transportation, labor, materials, and equipment to furnish and install the following plumbing fixtures and related components:
   1. Water closets.

B. Accessible Fixtures, CBC Division 6 / 11B:
   1. Accessible plumbing fixtures shall comply with all the requirements of CBC Division 6.
   2. Heights and location of all fixtures shall be according to the CBC Division 6, Sections 11B-602 through 11B-612; refer to architectural plans.
   3. Accessible fixture controls shall comply with CBC Sections 11B - Section 11B-602.3 for drinking fountains; Section 11B-604.6 for water closers; Section 11B-605.4 for urinals; Section 11B-606.4 for lavatories and sinks; Section 11B-608.5 for showers and Section 11B-611.3 for washing machines and clothes dryers.
   4. Each accessible sink shall be a maximum of 6-1/2” deep. Sinks shall be mounted with the counter or rim no higher than 34” above the finish floor.
   5. Hand-operating metering faucets shall remain open for 10 seconds minimum per CBC Section 11B-606.4.
   6. All single-user toilet facilities shall be identified as Gender-Neutral facilities by a door symbol in accordance with CBC Section 11B-216.8 and 11B-703.2.6.3; refer to architectural plans.
   7. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1; refer to architectural plans.
   8. Fixtures and accessories provided in a toilet room shall comply with CBC Section 11B-213.2 through 11B-213.3; refer to architectural plans.
   9. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34” maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Sections 11B-606.3 and 11B-606.7.
   10. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories and sinks. CBC Section 11B-606.5.

C. Performance, Cal Green – refer to table 5.303.3 on sheet P0.00:
   1. Flush Valves: Flushometer valve type single flush with maximum volume of 1.28 gallons per flush (gpf) for water closets and 0.125 gallons per flush (gpf) for urinals.

2. Faucets: Public lavatories shall be equipped with faucets with a maximum flow of 0.5 gallons per minute (gpm). Kitchen faucets shall be equipped with a maximum flow rate of 1.8 gallons per minute (gpm).

1.02 REFERENCES

A. American National Standards Institute:
1. ANSI A117.1 – Accessible and Usable Buildings and Facilities
2. ANSI Z358.1 – Emergency Eyewash and Shower Equipment

B. Air Conditioning and Refrigeration Institute:
1. ARI 1010 – Self-contained, Mechanically Refrigerated Drinking Water Coolers

C. American Society of Mechanical Engineers
1. ASME A112.6.1 – Floor-Affixed Supports for Off-the Floor Plumbing Fixtures for Public Use.
2. ASME A112.18.1 - Plumbing Fixture Fittings.
3. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
4. ASME A112.19.2M - Vitreous China Plumbing Fixtures.
5. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
6. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
7. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals.

1.03 RELATED DOCUMENTS

A. COMMON WORK RESULTS FOR PLUMBING Section 22 05 00

B. HANGERS & SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT Section 22 05 29

C. JOINT SEALANTS PROTECTION Section 07 92 00.

D. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this section.

1.04 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

C. FRP: Fiberglass-reinforced plastic.

D. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.05 SUBMITTALS

A. Section 01 30 00 – Administrative Requirements: Submittal Procedures

B. Manufacturer's Literature: Submit brochures on all materials and equipment to the Engineer.

C. Other Submittals:
1. Shop Drawings.
2. Sterilization Test Report.
3. Test Data.
4. Operations and Maintenance Manuals.
5. Record Drawings.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

PART 2 - PRODUCTS - Refer to sheet P0.00 Fixture and Equipment Schedules.

2.01 MANUFACTURERS

A. Flush Valves: As specified; refer to plumbing fixture schedule.

B. Plumbing Fixtures: As specified; refer to plumbing fixture schedule.

C. Toilet Seats: Church, Beneke, Olsonite

2.02 PLUMBING FIXTURES AND TRIMS

A. Water Closet (WC-1): Floor mounted, ADA compliant, flush valve.
1. Vitreous china, siphon jet action, elongated bowl, 1.28 gallon flush.
2. American Standard 3043.001 Madera
3. Solid plastic white open-front seat less cover: Olsonite 95SSCT.
4. Flush Valve: Sloan Royal 111-1.28 flush valve 1.28 GPF.
5. Do not interfere flush valve with handle bar, see Architectural drawings.
6. Flush valve handle shall be on the wide side of stall.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install counter-mounting fixtures in and attached to casework.

G. Install fixtures level and plumb according to roughing-in drawings.

H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

L. Install toilet seats on water closets.

M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

O. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install traps on fixture outlets.
1. Exception: Omit trap on fixtures with integral traps.

Q. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

S. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.03 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.04 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.05 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers. Replace damaged and malfunctioning units.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.06 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
   1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
   2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.07 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Engineer.

END OF SECTION

SECTION 26 00 00 - GENERAL ELECTRICAL SPECIFICATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This specification shall apply to all phases of Work hereinafter specified, shown on Drawings, or as required to provide a complete installation of electrical systems for this Project. Work required under this specification is not limited to just the Electrical Drawings - refer to Architectural, Structural, Landscape, and Mechanical/Plumbing Drawings, as well as all other drawings applicable to this project, which designate the scope of work to be accomplished. The intent of the Drawings and Specifications is to provide a complete and operable electrical system that includes all documents that are a part of the Contract.
   1. Work Included: Furnish labor, material, services and skilled supervision necessary for the construction, erection, installation, connections, testing, and adjustment of all circuits and electrical equipment specified herein, or shown or noted on Drawings, and its delivery to the Owner complete in all respects ready for use.
   2. The electrical Work includes installation or connection of certain materials and equipment furnished by others. Verify installation details, installation and rough-in locations from the actual equipment or from the equipment shop drawings.

B. Electrical Drawings: Electrical Drawings are diagrammatic, and are intended to convey the scope of work, indicating intended general arrangement of equipment, conduit and outlets. Follow Drawings in laying out Work and verify spaces for installation of materials and equipment based on actual dimensions of equipment furnished.

1.02 QUALITY ASSURANCE

A. Design, manufacture, testing and method of installation of all apparatus and materials furnished under requirements of these specifications shall conform to latest publications or standard rules of the following:
   1. Institute of Electrical and Electronic Engineers - IEEE
   2. National Electrical Manufacturers' Association - NEMA
   3. Underwriters' Laboratories, Inc. - UL
   4. National Fire Protection Association - NFPA
   5. Federal Specifications - Fed. Spec.
   6. American Society for Testing and Materials - ASTM
   7. American National Standards Institute - ANSI
   8. National Electrical Code - NEC
   9. National Electrical Safety Code - NESC
   10. Insulated Cable Engineers Association - ICEA
   11. American Institute of Steel Construction - AISC
   12. State and Municipal Codes In Force In The Specific Project Area

13. Occupational Safety and Health Administration (OSHA)
14. Electronics Industries Association/Telecommunications Industry Association (EIA/TIA)
15. California Electrical Code (where adopted)
16. Local Authority Having Jurisdiction (AHJ) Published Electrical Standards and Codes

B. Perform Work in accordance with the National Electrical Code, applicable building ordinances, and other applicable codes, hereinafter referred to as the "Code." The Contractor shall comply with the Code including local amendments and interpretations without added cost to the Owner. Where Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply unless variance is approved.
1. Comply with all requirements for permits, licenses, fees and codes. The Contractor, at Contractor's expense, shall obtain all permits, licenses, fees, special service costs, inspections and arrangements required for Work under this contract, unless otherwise specified.
2. Comply with requirements of the applicable utility companies serving this Project. Make all arrangements with utility companies for proper coordination of Work.

1.03 GENERAL REQUIREMENTS

A. Guarantee: Furnish a written guarantee for a period of (1) one-year from date of acceptance.

B. Wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, circuit breakers, etc., (all materials), arises on the Drawing and/or Specifications, the Contractor shall be responsible for providing and installing all material and services required by the strictest condition noted on Drawings and/or in Specifications to ensure complete and operable systems as required by the Owner and Engineer.

C. All Core Cutting, Drilling, and Patching:
1. For the installation of work under this Section, the aforementioned shall be performed under this Section of the Specifications and the Concrete section of the Specifications.
2. No holes will be allowed in any structural members without the written approval of the Project's Structural Engineer.
3. For penetrations of concrete slabs or concrete footings, the work shall be as directed in the Concrete Section of Specifications.
4. The Contractor shall be responsible for patching and repairing surfaces where he is required to penetrate for work under this contract.
5. Penetrations shall be sealed to meet the rated integrity of the surface required to be patched and repaired. The patched surface shall be painted or finished to match the existing surface.

D. Verifying Drawings and Job Conditions:

1. The Contractor shall examine all Drawings and Specifications in a manner to be fully cognizant of all work required under this Section.
2. The Contractor shall visit the site and verify existing conditions. Where existing conditions differ from Drawings, adjustment(s) shall be made and allowances included for all necessary equipment to complete all parts of the Drawings and Specifications.

1.04 WORK IN COOPERATION WITH OTHER TRADES

A. Examine the Drawings and Specifications and determine the work to be performed by the electrical, mechanical and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, disconnects, relays, and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment.

B. Provide a conduit-only system for low voltage wiring required for control of mechanical and plumbing equipment described in this or other parts of the Contract Documents. Install all control housings, conduits, and backboxes required for installing conductors to the controls.

C. Install separate conduits between each heating, ventilating and air conditioning sensing device and its control panel and/or control motor. Before installing any conduit for heating, ventilating and air conditioning control wiring, verify the exact requirements from the control diagrams provided with the equipment manufacturer's shop drawings.

1.05 TESTING AND ADJUSTMENT

A. Upon completion of all electrical work, the Contractor shall test all circuits, switches, light fixtures, lighting control and dimming systems including distributed systems, UPSs, generators, SPDs, lighting inverters, transfer switches, motors, circuit breakers, motor starters and their auxiliary circuits and any other electrical items to ensure perfect operation of all electrical equipment.

B. Equipment and parts in need of correction and discovered during such testing, shall be immediately repaired or replaced with all new equipment and that part of the system shall then be retested. All such replacement or repair shall be done at no additional cost to the Owner.

C. All circuit(s) shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.

D. All test reports, including copies of any required Energy Code Acceptance Forms (e.g. CA Title 24 Acceptance for Code Compliance Forms) should be submitted to the Engineer at completion of project.

1.06 IDENTIFICATION

A. Nameplates shall be provided for unit substations, switchgear, switchboards, distribution boards, distribution panels, panel boards, motor control centers, transformers, transfer switches, contactors, starters, disconnect switches, enclosed circuit breakers/switches, inverters, UPSs, PDUs, RDCs, SPDs, lighting control panels, dimming panels, door releasing system panels, fire alarm/central monitoring terminal cabinets/power supplies/control panels, and all low voltage system terminal and control cabinets.

1. Nameplate inscriptions shall be identical to the equipment designations indicated in plans and specifications. Nameplates shall be engraved with the device designation/identification on the top line, source identification for the device on the 2nd line per NEC, or CEC where adopted, Art 408.4 and load designation for the device on the bottom line. Where load designation consists of a branch circuit, omit bottom line. Where device designation is not indicated on plans/specifications, Contractor shall submit a written clarification request to the Engineer.
   Example: Transformer 1TA
   Source Disconnecting Location: Switchboard MSA located in Rm 110
   Load: Panels 1LA and 1 LB
2. All circuit breakers/fuses in switchgear, switchboards, distribution boards, distribution panels, UPS output circuit breakers, PDU sub-feed circuit breakers and motor control centers shall have individual nameplates located immediately adjacent to the respective device. Nameplate inscription shall identify the downstream equipment or device served by the circuit breaker or fuse.

B. Identification nameplates, UON, shall be laminated/extruded modified acrylic that is 3/32" thick, UV-stabilized, matte finish, suitable for use in 180 deg. F ambient, with beveled edges and engraved white letters 3/8" high, minimum, on 1-1/2" high black background (utility/normal and optional standby power systems) for single line of text. Where two lines of text are required, provide minimum 2" high nameplate. Where three lines of text are required, provide minimum 2.5" high nameplate. Provide white letters on red background for all NEC, or CEC where adopted, Article 517 essential power systems, Article 700 Emergency Systems, Article 701 Legally required standby systems and Article 708 COPS.

C. Identification nameplates for new switchgear, switchboards, distribution boards, distribution panels, panel boards and motor control centers shall be attached with switchgear manufacturer-provided screws via switchgear manufacturer factory pre-drilled holes. A factory option to rivet identification nameplates to the equipment is only acceptable if screw-fastened nameplates are not an available option from the switchgear manufacturer. Field drilling or other mechanical attachment methods that change/void the NEMA or NTRL rating of the enclosure are strictly forbidden.

D. Identification nameplates for transformers, transfer switches, disconnect switches, enclosed circuit breakers/switches, inverters, UPSs, PDUs, RDCs, SPDs, lighting control panels, dimming panels, door releasing system panels, terminal cabinets and all circuit breakers/fuses in switchgear, switchboards, distribution boards, distribution panels, UPS output circuit breakers, PDUs, PDU sub-feed circuit breakers, and motor control centers

shall be attached to the equipment by self-adhesive backing integral to the nameplates. When equipment is located outdoors, provide nameplates without self-adhesive backing and attach to equipment using weather-rated, UV-resistant epoxy. In all cases, clean surfaces before applying identification nameplates parallel to equipment lines.

E. Warning Placards, as required by General Single Line Diagram Notes for multiple power sources, or instruction placards, as required for all kirk-key interlock schemes, all UPS bypass procedures or as required elsewhere in the plans/specifications shall be engraved 1/2" high white lettering on a red background using the same material specified for identification nameplates with a self-adhesive backing. Warning/instruction placards shall be attached to the face of the equipment directly related to the placards. Provide a formal placard submittal for review by the Engineer prior to ordering any warning/instruction placards. In all cases, clean surfaces before applying warning/instruction placards parallel to equipment lines.

F. Receptacles that are part of a UL-listed under floor computer room whip assembly, ceiling and/or cable/ladder tray-mounted receptacles used in lab, manufacturing, commercial kitchen environments or that are serving telecom/data/AV racks and cabinets shall have identification nameplates located on the wiring device plate cover. Nameplates shall be self-adhesive, 3/32" thick Micarta with beveled edges, engraved 1/4" high white lettering on black background with serving power source, circuit identification and NEMA/IEC receptacle type. Use of two (2) separate nameplates per device plate cover is acceptable. Affix nameplates to be visible when plugs are occupying receptacles.

G. See wiring device section of this specification for wiring device plate cover labeling requirements.

H. See drawings for panel board schedule directory installation requirements.

I. See conduit installation section of this specification for conduit labeling requirements.

1.07 FINAL INSPECTION AND ACCEPTANCE

A. After all requirements of the Specifications and/or the Drawings have been fully completed; representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

1.08 RECORD DRAWINGS

A. Drawings of Record: The Contractor shall provide and keep up-to-date, a complete record set of drawings. These shall be corrected daily and show every change from the original

Drawings. This set of prints shall be kept on the job site and shall be used only as a record set. This shall not be construed as authorization for the Contractor to make changes in the layout without definite instruction in each case. Upon completion of the work, a set of reproducible Contract Drawings shall be obtained from the General Contractor and all changes as noted on the record set of prints shall be incorporated thereon with black ink in a neat, legible, understandable and professional manner. Refer to the Supplementary General Conditions for complete requirements.

1.09 APPROVALS, EQUALS, SUBSTITUTIONS, ALTERNATIVES, NO KNOW EQUAL

A. Approvals: Where the words (or similar terms) “approved”, “approval”, “acceptable”, and “acceptance” are used, it shall be understood that acceptance by the Owner, Architect and Engineer are required.

B. Equal: Where the words (or similar terms) “equal”, “approved equal”, “equal to”, “or equal by”, “or equal” and “equivalent” are used, it shall be understood that these words are followed by the expression “in the opinion of the Owner, Architect, and Engineer.” For the purposes of specifying products, the above words shall indicate the same size, made of the same construction materials, manufactured with equivalent life expectancy, having the same aesthetic appearance/style (includes craftsmanship, physical attributes, color and finish), and the same performance.

C. Substitution: For the purposes of specifying products, “substitution” shall refer to the submittal of a product not explicitly approved by the construction documents/ specifications.
   1. Substitutions of specified equipment shall be submitted and received by the Engineer ten (10) days prior to the bid date for review and written approval. Regulatory Agency approval for all substitutions will be the sole responsibility of the Contractor. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letterform and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples, if requested, must be included in the submittal. ONLY PRE-BID APPROVED PRODUCTS, ISSUED VIA A FORMAL BID ADDENDUM TO ALL BIDDERS, WILL BE ALLOWED ON THE PROJECT. REGARDLESS OF THE APPROVAL ON ANY SUBSTITUTION, ALL BIDS SHALL BE BASED ON THE PRODUCTS EXACTLY AS SPECIFIED. PRICING FOR EACH APPROVED SUBSTITUTION SHALL BE INCLUDED IN THE BID SUBMITTAL AS A SEPARATE LINE ITEM.
   2. In the event that written authorization is given for a substitution, after award of contract, the Contractor shall submit to the Engineer quotations from suppliers/distributors of both the specified and proposed equal material for price comparison, as well as a verification of delivery dates that conform to the project schedule.
   3. In the event of cost reduction, the Owner will be credited with 100 percent of the reduction, arranged by Change Order.

4. The Contractor warrants that substitutions proposed for specified items will fully perform the functions required.

D. Alternates/Alternatives: For the purposes of specifying products, "alternatives/alternates" may be established to enable the Owner/Architect/Engineer to compare costs where alternative materials or methods might be used. An alternate price shall be submitted in addition to the base bid for consideration. If the alternate is deemed acceptable, written authorization will be issued.

E. No Known Equal: For the purposes of specifying products, "No Known Equal" shall mean that the Owner/Architect/Engineer is not aware of an equivalent product. The Contractor will need to submit a "Substitution" item, per the requirements listed above, if a different product is proposed to be utilized.

1.10 SHOP DRAWINGS/SUBMITTALS

A. Shop Drawings/Submittals, unless required otherwise by general project specifications or instructions to bidders, shall be submitted in electronic format (PDF) to include a Letter of Transmittal (PDF), which shall give a list of the drawings submitted with dates and/or system(s) components contained within the submittal. Drawings and material cut sheets shall be complete in every respect and edited/marked to indicate specific items being provided. Printed/Hard copies are not acceptable.

B. The Shop Drawings/Submittals shall be marked with the name of the project, numbered consecutively, and bear the approval of the Contractor as evidence that the Contractor has checked the Drawings. Any Drawings submitted without this approval will be returned to the Contractor for resubmission.

C. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in the Contractor's letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment that may be caused by the substitution. Samples shall be submitted when requested.

D. Only products listed as "Equal" within the contract documents, along with formally approved "Substitutions" will be reviewed. Products not conforming to these items will not be reviewed and will be returned to the Contractor for re-submittal.

E. Review comments used in response to shop drawings/submittals are:
   1. "No Exception Taken" - Product approved as submitted.
   2. "Furnish as Corrected" - Re-submittal not required, although the Contractor shall provide the submitted product with corrections as noted.
   3. "Revise and Resubmit" - Re-submittal required with corrections as noted.
   4. "Rejected" - Re-submittal required based upon the originally specified product.

F. Shop drawings shall be submitted on the following but not limited to:
   1. Lighting Fixtures, Lamps, and Ballasts.

2. Switchgear, Switchboards, Distribution Boards, Motor Control Centers, Panel boards, and Bus Ducts; complete with overcurrent device information.
3. Transformers.
4. Fire Alarm System/Central Monitoring System.
5. Wiring Devices.
6. Lighting Control System/Dimming System Products.
7. Pullboxes and Underground Vaults.
8. Terminal Cabinets
9. Lighting Inverters, UPSs, RDCs, PDUs, Generators, Transfer Switches, SPD Systems.
10. Cable Tray, Flexible Cable Tray and Cable Runway.
11. Power Poles and Floor Boxes.
12. Arc Flash, Short-Circuit and Coordination studies.
13. All other products called out on drawings that call for shop drawing submittal.

1.11 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRING DIAGRAMS

A. Prior to final acceptance of the job, the Electrical Contractor shall furnish to the Owner at least four (4) copies of operating, maintenance, and servicing instructions, as well as four (4) complete wiring diagrams for the following, but not limited to, items or equipment:
   1. Lighting Control System/Dimming Systems.
   2. Fire Alarm System.
   3. Transformers.
   4. Switchgear, Switchboards, Distribution Boards, Motor Control Centers, Panel boards, and Bus Ducts; complete with overcurrent device information
   5. Lighting Inverters, UPS's, PDUs, Generators, Transfer Switches, SPD Systems

B. All wiring diagrams shall specifically cover the system supplied. Typical drawings will not be accepted. Four (4) copies shall be presented to the Owner.

1.12 INTERRUPTION OF SERVICE/SERVICE SHUTDOWN

A. Any interruption of electrical services, electrical circuits, electrical feeders, signal systems, communication systems, fire alarm systems, etc. required to perform work, shall meet the specific prior-approval requirements of the Owner. Such work shall be scheduled with the Owner to be performed at the Owner's convenience.

B. Interruptions/outages of any of the Owner’s systems and services mentioned above shall be scheduled to occur during other than the Owner’s normal business hours. Any overtime costs shall be borne by the Contractor.

C. See drawings for any additional requirements regarding outages, interruption and any temporary services required.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and Equipment: All electrical materials and equipment, including custom-made equipment, shall be new and shall be listed by Underwriter's Laboratories (UL) and bear their label or be listed and certified by a Nationally Recognized Testing Lab (NRTL) that is also recognized by the local Authority-Having-Jurisdiction (AHJ)

B. Switchgear/Switchboards/Distribution Boards/Motor Control Centers:
   1. See general single line notes on single line drawing for more information.

C. Panel boards – Branch Circuit:
   1. See drawings for panel board schedules and specifications.

D. Transformers:
   1. See drawings for transformer schedules and specifications.

E. Lighting Fixtures:
   1. See drawings for lighting fixture and lamp schedules and additional specifications. Furnish, install and connect a lighting fixture at each outlet where a lighting fixture type symbol (designated on plans) is shown as being installed. Each fixture shall be complete with all required accessories including sockets, glassware, boxes, and spacers, mounting devices, fire rating enclosure and lamps.
   2. Ballasts: See lighting fixture schedule notes. All noisy ballasts shall be replaced at no cost to the Owner.
   3. Lamps: See lamp/fixture schedule and lamp/lighting fixture schedule notes.

F. Wiring Devices:
   1. Provide wiring devices indicated per plan. Devices shall be specification grade. Acceptable manufacturers are Leviton, Pass and Seymour and Hubbell. Provide all similar devices of same manufacturer, unless indicated otherwise. All device colors shall be from the full range of manufacturer standard color options as selected by the Architect. This selection will be made during the shop drawing review process
      a. Wiring Devices (Decora)
         1) Convenience Receptacle #16252- ???
         2) Dedicated Receptacle #16352-???
         3) Convenience I.G. Receptacle #16262-IG-???
         4) Dedicated I.G. Receptacle #16362-IG-???
         5) Convenience G.F.C.I. Receptacle #GFT1-???
         6) Dedicated G.F.C.I. Receptacle #GFNT2-???
         7) Convenience Hospital Grade Receptacle #16252-HG?-???
         8) Dedicated Hospital Grade Receptacle #16352-HG?-???
         9) Convenience G.F.C.I. Hospital Grade #GFNT1-HG?
         10) Dedicated G.F.C.I. Hospital Grade #GFNT2-HG?
         11) Tamper Resistant Convenience Receptacle #TDR15-???
         12) Tamper Resistant Dedicated Receptacle #TDR20-???
         13) Tamper Resistant GFCI Receptacle #GFTR2-???
         14) Tamper Resistant. Convenience. G.F.C.I. Hospital

Grade Receptacle #GFTR1-HG?
15) Tamper Resistant. Dedicated. G.F.C.I. Hospital
16) Grade Receptacle #GFTR2-HG?
17) Weather/Tamper Resistant GFCI Receptacle #GFWT2-???
18) Convenience Simplex Receptacle #16251-???
19) Dedicated Simplex Receptacle #16351-???
20) Recessed Clock Receptacle #5361-CH-???(Non-Decora)
21) Single Pole Switch #5621-2-???
22) Double Pole Switch #5622-2-???
23) Three Way Switch #5623-2-???
24) Four Way Switch #5624-2-???
25) Pilot Light Switch “On” #5628-2-???
26) Pilot Light Switch “Off” #5631-2-???
27) Projection Screen Switch #5657-2-???
28) Low Voltage Momentary Switch #5657-2-???
29) Keyed Switch #1221-2L-???(Non-Decora)
30) Door Jam Switch #1865-???

b. Use of dedicated receptacles is required where plans depict a branch circuit supplying only a single simplex or duplex receptacle. Use of controlled receptacles is required where depicted on plans - see controlled receptacle specifications for additional information.

2. I.G. (isolated ground) receptacle bodies shall be of a basic color specified above with an orange triangle to symbolize isolated ground.
3. H.G. (hospital grade) receptacle bodies shall be of a basic color specified above with a green circle to symbolize hospital grade.
4. When shown circuited with an I.G. conductor, receptacles shall be of an I.G. type. As an example, a NEMA L6-30R denoted on the plans and shown circuited with an I.G. conductor shall be an I.G. version of that receptacle.
5. Wiring devices located in wood finished areas shall generally be black unless otherwise indicated by the Architect.
6. Wiring devices located in mirrors shall generally be white with stainless steel cover plates unless otherwise indicated by the Architect.
7. In addition to other device requirements listed elsewhere in this specification, 125V (Volt), 15A (Amp) and 20A Tamper-Resistant wiring devices shall be provided as follows:
   a. In dwelling units per NEC, or CEC where adopted, Article 210.52.
   b. In pediatric care areas per NEC, or CEC where adopted, Article 517.18(C).
   c. In child care or day care facilities.
   d. In wet and/or exterior locations.
8. Wiring devices shall be listed “hospital grade”, and so identified, in the following locations:
   a. Patient bed locations within general care areas per NEC, or CEC where adopted, Article 517.18(B).
   b. Patient bed locations within critical care areas per NEC, or CEC where adopted, Article 517.19(B).

c. In “other-than-hazardous” anesthetizing locations per NEC, or CEC where adopted, Article 517.61(C)(2).

9. Wiring device cover plates located on recessed boxes shall be commercial grade nylon. Plate color shall match wiring device color UON on plans. Cover plates utilized on surface mounted boxes shall be metal. Plastic cover plates are unacceptable.
10. Except as otherwise noted, all wiring device plates on the project shall be labeled with panel and circuit number(s) utilizing a Brother P-Touch labeling system with 1/2" tape (yellow on black) or equal by Herman-Tellerman or Panduit. Locate label on the concealed side of the wiring device plate. Handwritten labels are unacceptable.
11. The Contractor shall provide duplex receptacle outlets in the appropriate configurations necessary to comply with applicable energy code requirements for controlled receptacles and as shown on plans. All wiring devices indicated to be controlled receptacles shall be NEMA-approved, electrical code-compliant with factory markings on the face of the receptacle(s) with the word "Controlled" or utilize further markings and symbols to indicate which receptacles on each outlet is/are controlled. Stickers, field-applied markings or other non-permanent markings are not acceptable. Where a GFCI receptacle outlet is required to be controlled, provide an adjacent controlled duplex receptacle outlet connected on the load side of the GFCI outlet. Generally, one receptacle in a duplex receptacle outlet is required to be controlled. It may be the lower receptacle or upper receptacle based on manufacturer offering. However, the controlled receptacle location within a controlled receptacle outlet shall remain consistent throughout the project. Where an existing duplex receptacle outlet is required to be controlled, provide a new wiring device with the appropriate control configuration necessary to comply with plans. All controlled receptacles shall be connected to a branch circuit controlled by an occupancy sensor-based or relay panel lighting control system. Acceptable manufacturers are Leviton, Pass and Seymour and Hubbell.
12. The following wiring device plates shall have custom engraving:
    a. Key operated switches, switches with pilot lights, and switches for the control of motors, heaters and ventilators. Engraving shall be black and occur on the exposed side of the plate indicating the motor, heater, or ventilator controlled.
    b. Receptacles on optional standby generator and/or UPS power shall have custom engraved plates with the words "Generator" or "UPS" in black letters. In addition, where located in telecommunications closets, IDFs, server rooms, data centers, labs (wet, dry or electronic) indicate panel board and circuit number.
    c. For Health Care Facilities, provide custom engraved device cover plates, for all devices, indicating panel board and circuit number. Devices served by normal/utility power circuits shall have black lettering. Devices served by essential electrical system power circuits shall have red lettering.
    d. All stainless steel and nylon device plates shall be engraved using a rotary engraving process except for black lettering on stainless steel device plates which may be accomplished via laser etching process. All lettering shall be

3/16" high. Provide a dimensioned submittal drawing detailing a typical device faceplate with engraving.

G. Weatherproof Outlet Covers/Assemblies: All Receptacles identified as weatherproof on the drawings shall be weather-resistant, tamper-resistant, GFCI type and equipped as follows:

1. Type WP-A: Recessed wall box with a hinged, lockable, cast aluminum, self-closing, gasket-equipped door that is wet location-listed rain tight while "in use". Unit shall comply with NEC, or CEC where adopted, Article 406.9(A) and (B). UON on drawings, provide a minimum of 2 separate compartments suitable for installation of power receptacles, AV or communications outlets. Additionally, unless otherwise noted on drawings, provide the following:
   a. A 20A weather-resistant, tamper-resistant, GFCI duplex receptacle in the first compartment. Provide branch circuiting per plans.
   b. A blank metal plate suitable for field installation of power, AV or communications devices in the second compartment.
   c. Where indicated on plans as requiring data, AV, or other low voltage service outlet, provide minimum 3/4" C.O. with pull string routed from the second compartment to nearest low voltage pull box. Where shown mounted in a building wall, any blank/unused compartment shall be equipped min. 3/4" C.O. with pull string routed to the nearest accessible ceiling space.
   d. See wiring device section of this specification for additional wiring device plate cover labeling requirements.
   e. 1 key minimum per device (minimum of 2 per project) to the Owner's project manager upon completion of project.
   f. Custom color powder coat finish as selected by Architect - Include all costs in base bid for same.
   g. In locations with sufficient wall depth, provide 6" wide x 6" tall x 5-1/2" deep recessed wall box (C.W. Cole #TL310-WCS-K1-CUSTOM COLOR).
   h. In locations utilizing shallow stud walls construction or other walls of insufficient depth, provide 10-3/4" wide x 7-3/8" tall x 3-7/8" deep recessed wall box (C.W. Cole #TL310-WCS-SH-K1 -CUSTOM COLOR).
   i. See drawings for additional details.
2. Type/Subscript WP-B: Wet location-listed raintight while "in use" cast copper-free aluminum lockable cover with baked aluminum lacquer finish and one gang, weather-resistant, tamper-resistant GFCI receptacle. Hubbell WP26E series. Polycarbonate covers are unacceptable. Unit shall comply with NEC, or CEC where adopted, Article 406.9(A) and (B). Contractor shall powder coat cover assembly to a custom color where receptacle locations are deemed by the Architect to be in aesthetically sensitive or public spaces. Custom color as selected by Architect.
3. Type WP-C: (C.W. Cole #TL310-WCS-PED-ADA-K1-CUSTOM COLOR or #TL310-WCS-PED-K1-CUSTOM COLOR) pedestal device box with a hinged, lockable, cast aluminum, self-closing, gasket-equipped door that is wet location-listed raintight while "in use". Unit shall comply with NEC, or CEC where adopted, Article 406.9(A) and (B). UON on drawings, provide a minimum of 2 separate compartments suitable for installation power receptacles, AV or communications outlets. Additionally, unless otherwise noted on drawings, provide the following:

a. A 20A weather-resistant, tamper-resistant, GFCI duplex receptacle in the first compartment. Provide branch circuiting per plans.
b. A blank metal plate suitable for field installation of power, AV or communications devices in the second compartment.
c. Where indicated on plans as requiring data, AV, or other low voltage service outlet, provide minimum 3/4" C.O. with pull string routed from the second compartment to nearest low voltage pull box.
d. See wiring device section of this specification for additional wiring device plate cover labeling requirements.
e. 1 key minimum per device (minimum of 2 per project) to the Owner's project manager upon completion of project.
f. Include all costs in base bid for ADA version (22.5" tall) of pedestal box. Prior to ordering material, contractor shall coordinate with Architect and/or AHJ to determine which pedestal box locations do not require ADA compliance and may be changed to the standard (11.5" tall) version of the pedestal box.
g. Custom color powder coat finish as selected by Architect. Include all costs in base bid for same.
h. See drawings for additional details.

4. Type/Subscript WP-D: Damp location-listed (not-Raintite-in-use) cast copper-free, pad lockable, die-cast aluminum cover with baked aluminum lacquer finish and one gang GFCI receptacle. Hubbell/Rayco 502?/503? Series. Polycarbonate covers are unacceptable. Unit shall comply with NEC, or CEC where adopted, article 406.9(A) and (B). Custom color powder coat finish as selected by Architect. Include all costs in base bid for same.

H. Motor Controllers/Starters: See drawings for motorized equipment schedules and specifications.

I. Circuit Breakers:
1. Service entrance circuit breakers smaller than 400A (Amp) frame shall be thermal-magnetic trip with inverse time current characteristics unless otherwise indicated below. Service entrance main circuit breakers and main circuit breakers, 400A frame and larger, shall be 100% rated, solid-state type as outlined in this specification. All other service entrance circuit breakers, 400A frame and larger, shall be 100% rated, solid-state type as outlined in this specification.
2. All non-service entrance circuit breakers 225A and larger shall be thermal magnetic type and have continuously adjustable instantaneous pick-ups of approximately 5 to 10 times trip rating. Breakers shall have either tamper-resistant rating dials or easily changed trip rating plugs with trip ratings as indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Additionally, all non-service entrance circuit breakers, 600A frame and larger, located in 480V, 3-phase, 3-wire or 277/480V, 3-phase, 4-wire switchgear, distribution boards, panel boards or busway plugs shall be solid state, 100% rated. Breaker shall have built-in test points for testing long delay, short delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120V operated test kit. Contractor shall utilize a test kit capable of testing all breakers 400A and above - at the Engineer’s request.

3. All non-service entrance circuit breakers less than 225A shall be molded plastic case, air circuit breakers conforming to UL 489. Provide breakers with thermal magnetic trip units, and a common trip bar for two- or three-pole breakers, connected internally to each pole so tripping of one pole will automatically trip all poles of each breaker. Provide breakers of trip-free and trip-indicating bolt-on type, with quick-make, quick-break contacts. Provide single two- or three-pole breaker interchangeability. Provide padlocking device for circuit breakers as shown on the Drawings.
4. Where a Current Limiting Circuit Breaker (CLCB) is indicated on drawings or as required elsewhere in this specification, provide a UL listed current limiting thermal magnetic circuit breaker(s) UON. An independently operating limiter section within a molded case is not allowed. Coordinate CLCB ratings as required to protect electrical system components on the load side of the CLCB to include, but not limited to, protecting automatic transfer switches, panel boards and lighting control panels.
5. Where a solid-state circuit breaker is indicated on drawings or as required elsewhere in this specification, provide a solid-state circuit breaker with minimum five function complete with built-in current transformers. The five functions shall be independently adjustable and consist of Overload/Long Time Amp Rating, Long Time Delay, Short Time Delay, Short Circuit/Instantaneous Pickup, but may also include Shunt Trip and/or Ground Fault if so indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Breaker shall have built-in test points for testing long delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120V operated test kit. Contractor shall utilize a test kit capable of testing all breakers 400A and above, at the Engineer's request.
6. Circuit breakers, 1200A Frame or larger, or circuit breakers with sensors or adjustable trip settings, 1200A or larger, shall be equipped with an Energy Reducing Maintenance Switch that complies with NEC, or CEC where adopted, 240.87 (B) (3) unless specified elsewhere with an alternate arc energy reduction method allowed by this same code section.
7. Ground Fault Interrupting Breakers: Provide with molded plastic case, air circuit breakers, similar to above with ground fault circuit interrupt capability, conforming to UL Class A, Group 1.
8. Arc Fault Interrupting Breakers: Provide with molded plastic case, air circuit breakers, similar to above with arc fault circuit interrupt capability, conforming to UL 1699. Provide on all dwelling-unit circuits supplying bedrooms, sleeping quarters etc. as required to comply with NEC, or CEC where adopted, Article 210.12.
9. Tandem or half-sized circuit breakers are not permitted.
10. Series-Rated Breakers: UL listed series-rated combinations of breakers can be used to obtain panelboard-interrupting ratings shown on Drawings. If series-rated breakers are used, switchboards, distribution boards, and panel boards shall be appropriately labeled to indicate the use of series-rated breakers. Shop drawing submittal shall include chart of UL listed devices, which coordinate to provide series rating.

11. Circuit breakers shall be standard interrupting construction. Panelboard shall accept standard circuit breakers up to 100A.
12. Circuit breaker handle accessories shall provide provisions for locking handle in the on or off position.
13. Shunt-trip equipped circuit breakers shall be provided on all elevator feeders.
14. Temperature compensating circuit breaker(s) shall be provided when located in outdoor enclosure(s) or when located in an enclosure subject to high ambient heat due to due nearby industrial processes, etc.
15. Provide 75 degree Celsius-rated conductor lugs/lug kits as required on all circuit breakers to accept conductor quantities and sizes shown on drawings.
16. All circuit breaker terminations shall be suitable for use with 75-degree Celsius ampacity conductors. Listed, dual-rated pin terminals, straight or offset, are acceptable for use to in accommodating oversized or parallel conductor installations.
17. Circuit breakers serving Fire Alarm or Central Monitoring panels and power supplies shall be red in color and lockable in the “ON” position.

J. Disconnect Switches:
1. Non-fusible or fusible, heavy-duty, externally-operated horsepower-rated, 600V A.C: Provide NEMA 3R, lockable enclosures for all switches located on rooftops, in wet or damp areas and in any area exposed to the elements.
2. Fusible switches shall be Class “R” when 600A or less or Class “L” when greater than 600A.
3. Amperage, Horsepower, Voltage and number of poles per drawings: All shall be clearly marked on the switch nameplate.
4. Provide the Owner’s project manager with one (1) spare set of fuses and two (2) sets of fuse clips/fuses for every set of fuses on the project.

K. Fuses:
1. Provide fuses at all locations shown on the Drawings and as required for supplemental protection:
   a. Fuses shall be manufactured by Bussman, Shawmut, or equal.
   b. All fuses shall be the product of a single manufacturer.
2. Main and Feeder Protection:
   a. Protective devices rated greater than 600A: Provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.
   b. Protective devices rated 600A or less: Provide Bussman Class R fuses, Class RK series current limiting fuses, having an interrupting rating of 200,000A RMS.
3. Motor Protection:
   a. Where rating of protective device is greater than 600A, provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.
   b. Where rating of protective device is 600A or less, provide Bussman Class RK series current limiting fuses, having an interrupting rating of 200,000A RMS.

c. Where fuses feeding motors are indicated, but not sized, it shall be the responsibility of the Contractor to coordinate the fuse size with the motor to provide proper motor running protection.
d. When rejection type fuses are specified (Class RK series) the fuse holder of all switches (specified in other Sections) shall be suitable for the fuses provided.

L. Cable Tray, Flexible Cable Tray and/or Cable Runway:
1. See drawings for Cable Tray, Flexible Cable Tray and/or Cable Runway specifications.

M. Uninterruptible Power Systems (UPS):
1. See drawings for UPS schedules and specifications.

N. Power Distribution Units (PDU):
1. See drawings for PDU schedules and specifications.

O. Generator Systems:
1. See drawings for Generator schedules and specifications.

P. Transfer Switches:
1. See drawings for Transfer Switch schedules and specifications.

Q. Lighting Control/Dimming Systems:
1. See drawings for Lighting Control and/or Dimming Systems schedules and specifications.
2. Wall box dimmers shall be rocker-type as manufactured by Lutron (no known equal except as noted below). Dimmers and dimmer faceplates shall match the color of adjacent switches and faceplates. Dimmers and dimmer faceplates in wood finished areas shall generally be black unless otherwise indicated by the Architect. The Contractor shall obtain written approval of the Architect regarding final dimmer and dimmer faceplate color selection prior to ordering material. Multiple dimmers/switches shall be ganged together with a common cover plate. Provide dimmers as follows:
a. Incandescent: Lutron DIVA DV-10P or DV-103P (3-way) (1000-Watt max.).
b. Electronic Low Voltage: Lutron DIVA DVELV-300P or DVELV-303P-(3-way) (300 Watt).
c. Magnetic Low Voltage: Lutron DIVA DVLV-10P or DVLV103p (3-way) (800-Watt max.).
d. Fluorescent (3-Wire): Lutron DIVA DVF-103P (single/3way, 8A @ 120V) or DVF-103P-277 (single/3way, 6A @ 277V).
e. Fluorescent (0-10V): Lutron DIVA DVTV with PP-???H Power Pack.
f. Fluorescent (Lutron Tu-Wire): Lutron DIVA DVFTU-5A3P with Lutron H.P. module where required.
g. LED (0 - 10V): Lutron DIVA DVTV with PP-???H Power Pack.
h. Screw Base CFL/LED: Lutron DIVA DVCL-153P.
i. Fan Control: Lutron DIVA DVFSQ-F (1.5A @ 120V max, 3 speed, single pole, 3-way).

3. Contractor shall verify if dimmer(s) requires derating when ganged. Contractor shall provide, and provide connections to, additional Lutron Power Modules, Lutron Power Packs, and / or Lutron Interface Modules where required to accommodate loads higher than dimmers standard or derated load-carrying capacity. Note - contractor may to provide a Lutron recommended dimmer type (typically a #DVF-103P unit) to control the necessary power modules or interface devices.

R. Fire Alarm System/Central Monitoring System:
1. See drawings for Fire Alarm System or Central Monitoring System specifications.

S. Surge Protective Device (SPD):
1. See drawings for SPD specifications.

T. Conduit:
1. Galvanized Rigid Conduit (GRC) shall be full weight threaded type steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metalizing, or sherardizing process.
2. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242, and meet Federal Specification WWC-581 (latest revision).
3. Electrical Metallic Tubing (EMT) shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces. EMT shall be dipped in a chromic acid bath to chemically form a corrosion-resistant protective coating of zinc chromate over galvanized surface.
4. Flexible metal conduit shall be constructed of aluminum or hot-dipped galvanized steel strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Use only as directed in writing by the Engineer with the exception of 400 Hz feeders and 400 Hz branch circuits which shall be run in flexible aluminum conduit.
5. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory-installed fittings. For outdoor installations and motor connections only unless otherwise noted on drawings.
6. Factory assembled, or off-site assembled wiring systems (such as Metal Clad (MC) Cable, Type AC Cable, Type NM Cable, Type BX Cable, etc.) shall not be used unless otherwise indicated in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing.
7. MC cables shall not be allowed for lighting branch circuits (homeruns shall be EMT), receptacle branch circuits (homeruns shall be EMT) and poke-thru fed systems furniture homeruns. MC shall not be used where exposed, except for a maximum 6’ length for final connections to light fixtures, or terminate in electrical panelboards or distribution boards. Equipment ground conductor shall be green. Isolated ground conductor shall be green with yellow stripe. Provide 600V rated aluminum or lightweight steel interlocking cable with copper conductors, THHN (90-degree C) insulation, and integral equipment grounding conductor and isolated grounding conductor as required. Type AC cable listed for use in patient care areas for non-essential electrical system branch circuits per NEC or CEC where

adopted, Article 517.13 shall be required in such areas in lieu of MC cable. Type AC and MC cable shall not be used for essential electrical system branch circuits.

8. Nonmetallic Flexible Tubing (ENT) shall not be used unless otherwise indicated in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing. Use of ENT, if allowed, is strictly limited to use in CMU walls and parking structures decks or as directed in writing by the Engineer. See PART 3 - EXECUTION section in this specification for additional installation requirements.
9. Non-Metallic Conduit:
    a. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only with solvent welded joints, conforming to Underwriters Laboratories, Inc. (UL) requirements, listed for exposed and direct burial application.
    b. Conduit and fittings shall be produced by the same manufacturer.
10. Fire-rated Cable:
    a. 2-hour fire-rated, polymer insulated 600V cable listed and conforming to Underwriters Laboratories, Inc. (UL) 2196 and UL 1569 requirements for installation as an Electrical Circuit Protective System for use in complying with NEC, or CEC where adopted, Articles 695 and 700. Where adopted, cable sheath shall be suitable for use as a NEC or CEC equipment grounding conductor, and shall be listed for use in wet locations to 90 degrees C (Raychem or equal). MC cable shall not be used.
    b. Cable connectors shall be brass connectors.

U. Fittings:
1. Condulet type fittings shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system. These fittings shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.
2. Metallic condulet covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductors do not pass through the cover.
3. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.
4. UON all EMT fittings, connectors and couplings installed in concealed locations, areas not considered to be wet or damp locations by the AHJ, or areas not subject to physical damage, shall be steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. Where suitable for use, steel set screw fittings are allowed for trades sizes of 2” and smaller. Insulated throat is not required for fittings, connectors and couplings 1” and smaller.
5. All interior and exterior EMT fittings, connectors and couplings, 2” and smaller, installed in exposed or concealed locations that are considered by the AHJ to be wet or damp locations, shall be Raintite-listed, steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. If Raintite-listed, EMT fittings, connectors and couplings are unavailable for a given trade size or if conduit is installed in an area subject to damage – provide rigid metallic or intermediate metallic conduits, fittings, connectors and couplings as required.

6. Flexible steel conduit connectors shall be a malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.
7. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.

V. 600 Volt Conductors - Wire and Cable:
1. All conductors shall be copper. Provide stranded conductor for #10 AWG and larger or when making flexible connections to vibrating machinery. Use compression "fork" type connectors or transition to solid conductors when connecting to switches, receptacles, etc.
2. Type THHN/THWN-2 thermoplastic, 600 volt, UL approved, dry and wet locations rated at 90 degrees Celsius, for conductors of all sizes from #12 AWG up to and including 1000 kcmil. RHH/RHW insulation is allowed only to provide an Electrical Circuit Protective System to comply with NEC, or CEC where adopted, Articles 695 and 700.
3. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.
4. Wire and cable shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color-coded and it shall be maintained throughout.
5. Systems Conductor Color Coding:
   a. Power 208/120V, 3PH, 4W:
      1) Phase A = Black
      2) Phase B = Red
      3) Phase C = Blue
      4) Neutral = White or White with Phase Color Tracer
      5) Switch legs = Purple (Switch legs shall also be identified separately by numerical tags).
      6) Travelers = Purple with Black stripe or Pink.
   b. Power 480/277V, 3PH, 4W:
      1) Phase A = Brown
      2) Phase B = Orange
      3) Phase C = Yellow
      4) Neutral = Grey or Grey with Phase Color Tracer
      5) Switch legs = Purple (Switch legs shall also be identified separately by numerical tags).
      6) Travelers = Purple with black stripe or Pink..
   c. Ground Conductors: Green
   d. Isolated Ground Conductors: Green with continuous yellow stripe.
   e. Fire Alarm System: As recommended by the manufacturer.
6. All color-coding for #12 through #6 AWG conductor shall be as identified above. Conductors #4 AWG and larger shall be identified with utilizing phase tape at each termination.
7. No conductors carrying 120V or more shall be smaller than #12 AWG.
8. Aluminum conductors shall not be used.

9. Wire-pulling compounds used as lubricants in installing conductors in raceways shall only be "Polywater J". No oil, grease, graphite, or similar substances may be used. Pulling of #1/0 or larger conductors shall be done with an approved cable pull machine. Other methods; e.g. using vehicles and block and tackle to install conductors are not acceptable.

W. Medium Voltage Conductors (greater than 600V):
1. See drawings for Medium Voltage Cable Schedule and Specifications.

X. Junction and Pullboxes:
1. For interior dry locations, boxes shall be NEMA 1 galvanized one-piece drawn steel, knockout type, with removable, machine screw secured covers.
2. For outside, damp or surface locations, boxes shall be NEMA 3R heavy cast aluminum or cast iron with removable, gasketed, non-ferrous machine screw secured covers.
3. For in-grade applications, junction and pull boxes shall be pre-cast concrete or molded fiberglass manufactured by Christy, Brooks-Jensen, or Utility Vault Co. Fiberglass boxes shall:
   a. Be used only in landscape planter areas that are not subject to damage from lawnmowers, tractors and other machinery.
   b. Not be used in lawn or turf areas.
   c. Not exceed 11” W x 17” L in size unless required to be larger to meet code requirements.
4. All boxes shall be sized for the number and sizes of conductors and conduits entering the box and equipped with plaster rings where required.
5. All boxes located in traffic areas shall be traffic rated.

Y. Outlet Boxes:
1. For fixtures, boxes shall be galvanized, one-piece drawn steel, knockout type equipped with 3/8" fixture studs and plaster rings where required.
2. For convenience outlets, wall switches, or other devices, outlet boxes shall be galvanized one-piece drawn steel, knockout type 4" x 4"x 2-1/8" minimum size with plaster rings as required.
3. For locations where standard boxes are not suitable due to number and size of conduit to be terminated, special boxes shall be designed to fit space or meet other requirements, and submitted for approval.
4. For exposure to weather, damp locations, or surface mounting, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.
5. Outlet boxes used for support of ceiling fans shall be galvanized, one-piece drawn steel, knockout type equipped with bracing bars and plaster rings where required and listed for ceiling fan support use. Such boxes shall be labeled and capable of supporting ceiling fan weights up to 70 pounds.
6. See drawings for floor box installation notes and specifications.

Z. Plywood Backboards: Where indicated for telephone or communications system terminals or other equipment assemblies, provide backboards of size indicated. Use 3/4" thick x 8' all (length per plans), Douglas Fir, void-free, kiln-dried, fire-rated plywood

finished on one side and prime coat painted on all surfaces with finish coat of enamel paint, color by Architect. Leave one (1) fire-rating stamp/sheet exposed for inspection.

AA. Terminal Cabinets:
1. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, complete with barriered sections, a door for each vertically barriered section and sizes as indicated on plan. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.
2. Provide each terminal cabinet with a full size mounting backplate.
3. Terminal cabinets shall be installed complete with full-length skirts of the same construction and finish as the terminal cabinet.
4. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet.
5. All terminal cabinets and terminal cabinet barriered sections shall be labeled by the cabinet or cabinet section use (i.e. CATV, Security, etc.). Labels shall be Micarta type as specified elsewhere in these specifications. Unless otherwise noted, all termination blocks and cables shall be labeled per ANSI/EIA 606 standard.

BB. Painting: Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed in public view shall be painted with colors selected by the Architect to match the subject surfaces. Refer to painting section of the specifications for additional requirements.

CC. Seismic Design, Certification and Anchoring of Electrical Equipment:
1. Contractor shall include all costs in the base bid for labor, materials, all special inspections and structural engineering design necessary to meet the Seismic Design Requirements for Non-structural Components (Chapter 13, ACE SEI 7-05 Minimum Design loads for Buildings and Other Structures) as required by IBC, or CBC where adopted, Section 1708 and as related to the installation all electrical equipment furnished under this contract. See Specific Project Site Seismic Criteria on architectural and/or structural plans which include Building Occupancy Category, Seismic Design Category, Design Spectral Response Acceleration (S_{DS}), Height factor ratio (z/h) and Site Class. Non-structural Component Importance Factor (I_P) for a particular component shall be determined based on the following criteria:
   a. I_P = 1.0: Non-life safety, Non-structural Components in an Occupancy Category IV Facility not required for continued operations of the facility or in any other Occupancy Category Facility where component failure will not impair continued operation of the facility.
   b. IP=1.5: Designated Seismic Systems are those non-structural components in any Occupancy Category IV facility (except as noted above) or that are a part of any code-defined Critical, Life Safety, Emergency and Legally Required Standby Electrical System. Additionally, those non-structural components containing hazardous materials shall be classified as Designated Seismic Systems. While Designated Seismic Systems are

generally identified on the plans, they may include items such as generators, automatic transfer switches, UPS units and all associated electrical distribution equipment and components necessary for the designated seismic system to form a complete and operable system. The Contractor shall ultimately be responsible for identifying Designated Seismic Systems. For any electrical component either identified on the plans or determined by the contractor to be a Designated Seismic System, all line and load side electrical distribution systems supporting that Designated Seismic System (including, but not limited to, feeders, panel boards switchboards, transformers, all related component supports and attachments etc.) shall be considered a part of the designated seismic system for the purposes of code-compliance and seismic certification.

c. z/h - Height factor ratio: See plans for respective equipment locations.

2. Provide a delegated-design submittal for each of the following seismic-restraint systems to be used as required:
   a. Restraint Channel Bracings consisting of MFMA-4, shop-or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.
   b. Restraint Cables consisting of ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service, with a minimum of two clamping bolts for cable engagement.
   c. Seismic-Restraint Accessories consisting of hanger rod/hanger rod stiffener assemblies, multifunctional steel connectors for attaching hangers to rigid channel bracings and/or restraint cables, bushings for floor and wall-mounted equipment anchor bolts and resilient isolation washers and bushings.
   d. Mechanical Anchor Bolts consisting of drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
   e. Adhesive Anchor Bolts consisting of drilled-in and capsule anchor system containing resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide specific LEED-compatible environmentally-friendly resins and adhesives on all LEED projects. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
3. Submittal shall include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the contractor's structural engineer responsible for their preparation. Calculations shall include, but not be limited to, static and dynamic loading caused by equipment weight, operation, and seismic and, if applicable, wind forces required to select seismic and, if applicable, wind restraints and for designing vibration isolation bases. Provide seismic and wind-restraint detailing

to support system selection, arrangement of restraints, attachment locations, methods, and spacings with all components identified to include their strengths, directions and values of forces transmitted to the structure during seismic events and association with vibration isolation devices. Sizes of components shall be selected so strength will be adequate to carry present static and seismic loads to accommodate 25% spare future capacity within specified loading limits.

4. Any pre-approval and evaluation documentation shall have a California Office of Statewide Health Planning and Development (OSHPD) Special Seismic Certification Preapproval (OSP) demonstrating horizontal and vertical load testing and analysis showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
5. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified elsewhere in the project specifications.
6. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment. Flexible connection limitations of the NEC, or CEC where adopted, shall apply.
7. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction providing required submittals for component.
8. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by OSHPD or an agency acceptable to authorities having jurisdiction.
9. The contractor shall engage a qualified testing agency to perform tests and inspections as listed in other Project Specifications, but as a minimum shall include at least four of each type and size of installed anchors and fasteners selected by Architect. Schedule tests with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members as required. Test to 90 percent of rated proof load of device. Prepare and submit test and inspections reports.

DD. Trenching and Backfilling: Contractor shall be responsible for trenching and backfilling. Refer to Trenching and Backfilling section of the specifications for complete requirements.

PART 3 - EXECUTION

3.01 PREPARATION AND INSTALLATION

A. Installation of Conduit and Outlet Boxes:
1. All conduit installed in the dry walls or ceilings of a building shall be steel tube (EMT), aluminum tube (EMT), or Intermediate Metal Conduit (IMC). Flexible conduit shall not be used in lieu of EMT, IMC or rigid conduit except as noted herein.
2. Galvanized rigid conduit (GRC) or intermediate metal conduit (IMC) shall be used as follows:
   a. When noted on the drawings.
   b. When considered exposed to damage by the local AHJ.
   c. When installed in wet or damp locations and of a trade size where listed-Raintite fittings, connectors, couplings etc. are unavailable.
   d. When required by NEC or CEC Article 517.13.
   e. When installed in concrete and masonry. The use of ENT in CMU walls and parking structures may be allowed only as directed in writing by the Engineer. Request for ENT substitution must be made prior to bid and in accordance with pre-bid substitution requests requirements of these specifications.
3. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or steel-tube EMT and in accordance with NEC, or CEC where adopted, Article 342.
4. Flexible steel conduit shall only be permitted to be used at light fixture outlets and connections to vibrating electrical equipment. Except when concealed in walls or other structural elements, all flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of flexible conduit shall be allowed only as approved in writing by the Engineer.
5. Flexible liquidtight conduit shall be installed in lieu of the flexible steel; where required by the NEC, or CEC where adopted, in damp and wet location, where exposed to weather, in refrigerated area (65°F or less), and/or between seismic joints. All rotating electrical equipment shall be supplied with flexible, liquid-tight conduit with appropriate slack and shall not exceed thirty-six (36) inches. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of liquidtight flexible conduit shall be allowed as approved in writing by the Engineer on a case by case basis.
6. Rigid metallic conduit installed underground or embedded in concrete shall be 1” trade size minimum and shall be wrapped with 20 mil. Polyvinylchloride plastic tape, PVC conduit installed underground or embedded in concrete shall be 3/4" minimum trade size.
7. Where required for providing an electrical circuit protective system to comply with NEC, or CEC where adopted, Articles 695 and 700 utilize UL Listed 2-hour fire-rated, cable or UL Listed 2-hour fire-rated RHH/RHW conductors in conduit.
8. Conduit shall be run so as not to interfere with other piping fixtures or equipment.
9. The ends of all conduit shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.

10. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.
11. Where conduit is underground, under slabs or grade, exposed to the weather, or in wet locations, make joints liquid tight and gas tight.
12. All metal conduit in masonry and concrete and where concealed under floor slabs shall have joints painted with thread compound prior to makeup.
13. PVC conduit shall not be run in walls except where approved by the Engineer prior to bid in limited instances that may include concrete or CMU walls used in site retaining, parking structures, or exterior equipment yard or enclosure walls, etc.
14. Where conductors enter a raceway or a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.
15. Where conduit extends through roof to equipment on roof area, the Contractor shall provide flashing material compatible with the roofing system as required by the roofing specifications or as required by the Owner's roof warranty. This flashing shall be delivered to the roofing Contractor for installation. The actual location of all such roof penetrations and outlets shall be verified by the Architect/Owner. Contractor to verify type of flashing prior to bid and include all costs.
16. All conduit shall be supported at intervals not less than 6'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two-hole conduit clamp properly secured.
17. Where conduit racks are used the rack shall consist of two-piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.
18. Nail-in conduit supports, one-piece set screw type conduit clamps or perforated iron for supporting conduit shall not be used.
19. Seismic Conduit Support:
    a. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

CONDUIT SIZE	MAXIMUM SPACING
1/2" to 3"	6'-0"
3-1/2" to 4"	8'-0"

20. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.
21. Open knockouts in outlet boxes only where required for inserting conduit.
22. Locate wall outlet of the same type at same level in all rooms, except where otherwise noted.
23. Outlet boxes on metal studs shall be attached to metal hangers, tack welded or screwed to studs; on wood studs attachment shall be with wood screws, nails are not acceptable.
24. Recessed boxes shall not be mounted back-to-back in any wall; minimum offset shall be 24 inches.

25. Junction Boxes that do not contain any device(s) shall be located in storage rooms, electrical closets, or above accessible ceilings, not in hard lid ceilings or other forms of inaccessible ceilings. Place boxes which must be exposed to public view in a location approved by the Owner's Project Manager. Provide covers or plates to match adjacent surfaces as approved by the Owner's Project manager.
26. Surface mounted pull boxes, terminal cabinets, junction boxes, panel boards etc., shall be attached to walls using appropriate screws, fasteners, backing plates, stud blocking etc., as detailed on architectural and/or structural drawings. If architectural and/or structural drawings are not provided on the project, Contractor shall provide all necessary mounting hardware and backing support to comply with local building code requirements and any additional requirements imposed by the local Authority-Having-Jurisdiction.
27. Sleeves shall be installed where conduit passes through masonry or concrete walls and shall be 24-gauge galvanized steel no more than 1/2" greater in diameter than the outside diameter of the conduit. When located in non-rated structures, caulk conduit sleeve with stone wool and waterproof below grade. When located in fire rated structures, provide UL listed fire stopping system. See fire stopping section of this specification for additional requirements.
28. All boxes shall be covered with outlet box protector, Appleton SB-CK, or similar device/method to keep dirt/debris from entering box, conduit or panels. If dirt/debris does get in, it shall be removed prior to pulling wires.
29. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover, and painted as directed by the Architect with weatherproof paint to match building.
30. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.
31. Provide nylon or a 1/8-inch O.D. polyethylene rope, rated at 250 pounds tensile strength, in all conduits more than 5 feet in length left empty for future use. Not less than 5 feet of rope shall be left at each end of the conduit. Tag all lines with a plastic tag at each end indicating the termination/stub location of the opposite end of the conduit.
32. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/racks, Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system. Support conduit to structure above suspended ceilings 8" minimum above ceiling to allow removal of ceiling tile. Maintain two-inch clearance above recessed light fixtures
33. All exposed conduits and support hardware shall be painted to match the finish of the wall or ceiling to which it is supported.
34. Where conduits or wireways cross seismic joints, provide approved flexible conduit connection or approved expansion/deflection fitting to allow for displacement of conduit in all three axes. Connection shall allow for movement in accordance with design of seismic joint. Non-flexible raceways crossing expansion joints or other areas of possible structural movement shall make provision for 3-way movement at such points by means of expansion/deflection fittings. Fittings shall be installed in the center of their axes of movement and shall not be deflected to make part of a conduit bend, or compressed or extended to compensate for incorrect conduit

expansion/deflection fittings(s) complete with ground jumpers. Where necessary, provide approved expansion joints to allow for thermal expansion and contraction of conduit(s). Install expansion joints complete with ground jumpers.

35. Seal all conduits where termination is subject to moisture or where conduit penetrates exterior wall, floor or roof, in refrigerated areas, classified (hazardous areas) and as indicated on the drawings.
36. Except as otherwise indicated on the Drawings or elsewhere in these specifications, bends in feeder and branch circuit conduit 2 inches or larger shall have a radius or curvature of the inner edge, equal to not less than ten (10) times the internal diameter of the conduit. Except where sweeping vertically into a building, and where sweep radius equals ten (10) times conduit diameter, underground communications and building interconnect conduits 3 inches or larger shall have a minimum 12’-6” radius or curvature of the inner edge. For the serving utilities, radius bends shall be made per their respective specifications.
37. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit, footage end-to-end, and the location of the other end. In wet, corrosive outdoor or underground locations, use brass, bronze, or copper 16-gauge tags secured to conduit ends with #16 or larger galvanized wire. Inscribe on the tags, with steel punch dies, clear and complete identifying information.
38. The following additional requirements shall apply to underground conduits:
    a. Underground conduit shall be Schedule 40 PVC (polyvinyl chloride) unless otherwise indicated elsewhere in these specifications or as required per NEC, or CEC where adopted Article 517.13.
    b. For all communications conduits 2" and larger and feeders 100A or greater, provide with a minimum 3" inch, (2,000 LB) concrete envelope, 2-inch minimum separation between conduits, installed at depth of not less than 24" below grade. (Provide concrete encasement and/or greater minimum conduit depth as required by the Utility Companies.) Conduit separation within a duct bank shall be maintained using plastic spacers located at 5'-0" intervals. Where power and communication conduits are run in a common trench, a 12-inch minimum separation shall be maintained between power and communication conduits or as required by Utility Companies. Where concrete encasement is not required by serving utilities for a utility-only duct bank, provide free draining sand bedding suitable to achieve 95% relative compaction based on ASTM D1557 using 6” lifts or directed by Utility Company Standards.
    c. In all cases, where any conduit(s) pass under a building slab or footing, the electrical Contractor will provide a Bentonite clay or concrete barrier that conforms to the height and width of the trench excavation extending a minimum of 24” on either side of the foundation. In all cases, where conduit(s) pass through a sleeve in a footing or other foundation element, the electrical Contractor will provide a Bentonite clay or concrete barrier between the sleeve and the conduit(s) surrounding the conduit(s) for the entire depth of the sleeve. The barrier is required to prevent passage of moisture under or through the slab or footing via the trench or sleeve.

d. Where underground conduit passes under a building slab, concrete encasement may not be required, except as required above, contact the Engineer for written direction prior to omitting any encasement.

e. Underground conduits, which terminate inside building(s) below grade, such as in a basement level, or which slope so that water might flow into interior building spaces, shall be sealed at the point of penetration with a modular conduit seal (Link-Seal or equal by Rox Systems). Conduit/conduit sealing system penetrations of waterproofing membranes/systems on existing structures shall be completely restored as required to maintain membrane/system manufacturer and installer warranty for the installation. All conduits shall be provided with a 4% slope away from buildings. All conduits shall be installed such that the water cannot accumulate in the conduit and such that water drains into the nearest manhole, pull box or vault – not into the facility. In instances where grade changes or elevation differences prevent sloping of conduit away from a building into the nearest manhole, pull box or vault or where accumulation of water in a manhole, pull box or vault may result in water traveling into the facility, conduits shall be sealed internally at each end of each conduit using conduit sealing bushing, sized as required for the conductors contained within the conduit (O-Z Gedney #CSBG 100psig withstand or equal). In all cases, install plugs or caps in spare (empty) conduits at both ends of each conduit (Jackmoon or equal) preventing both water and gas from entering the facility via the conduits.

f. Include a separate insulated green ground conductor sized per NEC, or CEC where adopted, in each underground electrical feeder/branch circuit.

g. All underground conduits with circuits rated at 40As or greater and all underground communications conduits shall be provided with a metallic marker tape located 12 inches below the finished grade.

h. Where underground conduits sweep into/through slabs, utilize PVC 90 degree sweeps that transition, via female PVC adapter to GRC coupling mounted flush in slab. GRC couplings shall be 1/2 lap taped with 20-mil tape. If the distance of the conduit run between a sweep and the next connecting sweep, pullbox, vault or manhole exceeds 150 ft then the sweep shall be concrete encased. Exceptions:
    1) Communications conduits shown terminating at a finished floor shall have an additional 4” high GRC nipple equipped with a bushing, removable conduit plug, labeling tag and pull rope. Tie off pull rope to conduit plug.
    2) Utility conduit sweeps shall be installed per the requirements of the respective utility company.

i. All PVC conduit shall be glued for a water and gas tight installation. The Contractor shall use appropriate solvent on all joints prior to gluing conduit and fittings together.

j. All underground conduit work shall conform to the Federal, State and Local Safety Orders or Rules regarding excavations, trenches and related earthwork. For projects in California, refer to the California Code of

Regulations, Title 8, Construction Code Sections 1540 and 1541 for additional requirements.

39. Installation of Electrical Nonmetallic Tubing (ENT) Cable (when use is permitted in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing).
    a. When approved for use in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section, generally located on the symbols list drawing, 1/2" and 3/4” trade size ENT shall be allowed for concealed lighting branch circuits, receptacle branch circuits and miscellaneous signal system circuits within concrete floors, walls and columns within parking structures.
    b. ENT conduit shall meet the requirements of Underwriters Laboratories Standards 1479 and 1655, NEMA TC-13, and be UL-listed.
    c. All ENT conduit, ENT fittings, ENT boxes and ENT accessories shall be UL listed and manufactured by the same manufacturer so as to form a complete ENT system. ENT systems shall only be used if they are listed for use in fire resistance rated concrete floors and ceilings with resistance ratings as indicated elsewhere in the project plans. ENT system shall comply with NEC, or CEC where adopted, Article 362.
    d. All ENT fittings and ENT boxes shall be concrete-tight listed without the use of tape. Additionally, ENT fittings shall be constructed of high impact PVC and able to resist ENT conduit pull out forces of a minimum of 175 lbs. ENT fittings with fewer than 6 locking tabs for ENT connection shall utilize manufacturer approved glue as additional protection from fitting/conduit separation. ENT conduit to rigid conduit transition fittings shall be equipped with set screw fittings on the rigid conduit side of the fitting. ENT to metal box fittings shall be equipped with a threaded end and lock washer.
    e. Where tubing enters a box, fitting, or other enclosure provide a bushing or adapter to protect conductors from abrasion unless the box, fitting, or enclosure design provides equivalent protection.
    f. ENT junction boxes shall have brass screw inserts and shall be rated to support lighting fixtures weighing less than 50 lbs.
    g. Concrete tight metal boxes shall be used to support pendant hung fixtures or fixtures over 50 lbs.
    h. ENT shall be provided in continuous lengths between junction boxes without use of in-line splices or connectors and shall be clearly marked/labeled at least every 10 feet.
    i. All ENT conduit containing electrical branch circuits shall contain a code-sized equipment ground conductor.
    j. ENT shall transition to EMT, IMC, RMC, or rigid PVC, as appropriate or as called out elsewhere in this specification, for all exposed conduits within/on/under a parking structure.
    k. ENT shall transition to appropriately sized PVC expansion joint(s) at all structure expansion or seismic joints.
    l. ENT shall be securely fastened and supported every 2 – 3 ft. and within 1 ft. of every junction box and fitting to prevent movement and sag.

m. ENT shall be routed straight without sags, or excessive bending. Where bends are required, comply with Table 362.24 of the NEC for minimum radius of bends. Number of bends shall not exceed quantity allowed by code where used for power and lighting branch circuit and/or feeder conductors. Where utilized for communications system conductors (phones, data cabling, etc.) number of bends shall not exceed the equivalent of (2) 90-degree bends with conduit length no more than 100 feet without installation of a TIA 569-compliant pull box.

n. Separation of ENT from fittings, excessive sags, or deflections in ENT runs that prevent pulling of wire and other ENT system product or system installation failures/errors shall be corrected by saw cutting and patching as necessary at no additional cost to the Owner. Use of surface mounted conduits and junction boxes as a repair method is unacceptable.

o. Empty ENT runs shall be provided with a nylon pull string.

p. Coordinate installation of raceway with structural steel and other structural members. Do not cut, notch or otherwise alter structural members without obtaining approval in writing from the Structural Engineer of record.

q. No more than (2) 3/4” ENT conduits may cross each other within a horizontal concrete slab without obtaining approval in writing from the Structural Engineer of record.

B. Installation of 600-Volt Conductors:

1. All electrical wire, including signal circuits, shall be installed in conduit.

2. All circuits and feeder wires for all systems shall be continuous from over current protective device or switch to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.

   a. Utilize preinsulated "winged" spring type connectors, 3M Company "Performance Plus" #O/B or #R/Y or equal as required for splices and taps in conductors #6 AWG and smaller. When a spring connector is used in an underground environment or when subject to moisture, utilize a 3M Company Scotchcast 3507G epoxy resin connector sealing pack to seal the spring connector. THE USE OF PUSH-WIRE CONNECTORS (e.g. “WAGO” OR EQUIVALENT) IS STRICTLY PROHIBITED.

   b. Wires #4 AWG and larger AWG shall be joined together as follows:

      1) When located in an underground environment or when subject to moisture, the splice shall be made with compression connector and sealed by a 3M, or equal, PST cold shrink connector insulator.

      2) When located in an interior environment, the splice shall be made with an Ilsco or equal dual rated, insulated splice-reducer connector or multi-tap connector-listed for use with 75/90-degree Celsius rated conductors.

   c. Connections to busbar shall be made with dual-rated copper/aluminum one-piece compression lugs. Paralleled conductor connections shall be by mechanical lugs.

3. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires.

4. Install UL approved fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.

5. For 20A branch circuit wiring, increase #12 conductors to #10 for 120-volt circuits longer than 100 feet and for 277V circuits longer than 150 feet.
6. Conductor Support: Provide conductor supports as required by codes and recommended by cable manufacturer. Where required, provide cable supports in vertical conduits and provide lower end of conduit with a ventilator.

C. Grounding/Bonding:
1. Provide grounding and bonding for entire electric installation as shown on plans, as listed herein, and as required by applicable codes. Included, but not limited to, are items that require grounding/bonding:
   a. Conduit, Raceways and Cable Trays.
   b. Neutral or identified conductors of interior wiring system.
   c. Panel boards, Distribution Boards, Switchgear and Switchboards.
   d. Non-current carrying metal parts of fixed equipment.
   e. Telephone distribution equipment.
   f. Transformers, Inverters, UPS, PDU, RDC, Transfer Switch and Generator Systems.
   g. Raised Flooring.
   h. Exposed metal in maintenance holes, hand holes.
   i. Lightning Protection Systems and Antennas.
   j. Metal piping installed in or attached to a building/structure.
   k. Metallically isolated structural steel.
   l. Metallically isolated underground metal water piping.
   m. Elevator hydraulic piston/lift case.
2. In multi-occupancy buildings, Contractor shall bond metal water piping systems instated in, under or attached to a building and/or structure serving individual occupancies where the piping system(s) are metallically isolated from each other. Per NEC, or CEC where adopted ART. 250.104(A)(2) and (4), the bonding conductor shall be sized per Table 250.122 and connected to the switchboard/panel board serving that suite/occupancy.
3. Use of Ground Rods: Furnish and install required number of 3/4" x 10' copper clad ground rods to meet specified resistance, all required grounding wires, conduit and clamps. The size of the grounding conductors shall be not less than that set forth in the latest edition of the California Code of Regulations, Title 24, State of California and NEC (CEC, where adopted), unless otherwise indicated. Rods shall be installed such that at least 10 feet of length is in contact with the soil. Where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from vertical or shall be buried in a trench that is at least 30 inches deep. The upper end of the electrode shall be flush with or below ground level unless the above ground end and the grounding electrode conductor attachments are protected against physical damage. Unless otherwise noted, connection to the grounding electrode conductor may be by compression type or exothermic process connector. Mechanical connectors shall not be used.
4. Grounding System Connection:
   a. Compression connectors shall be unplated copper, manufactured by Burndy, or approved equal, designed specifically for the intended connection.

b. Exothermic weld-type connectors shall be 'Cadweld' manufactured by Erico Products, or approved equal, designed specifically for the intended connection.
c. Mechanical connectors shall not be used.

5. Isolated Ground Receptacles shall have an insulated ground wire connected between the receptacle and the panelboard isolated ground bus. Unless otherwise noted, this ground wire shall not be grounded at any other point, and shall be distinguished from other ground wires by a continuous yellow stripe.
6. Provide separate green equipment ground conductor in all electrical raceways to effectively ground all fixtures, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, busses, etc., for this purpose. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through #10 AWG. Use NEC (or CEC where adopted) Table 250.122 for conductor size with phase conductors #8 and larger, if not shown on the Drawings.
7. Clean the contact surfaces of all ground connections prior to making connections.
8. Ductwork: Provide a flexible ground strap, No. 6 AWG equivalent, at each flexible duct connection at each air handler, exhaust fan, and supply fan, and install to preclude vibration.
9. Motors: Connect the ground conductor to the conduit with an approved grounding bushing, and to the metal frame with a bolted solderless lug. Bolts, screws and washers shall be bronze or cadmium plated steel.
10. Building grounding system resistance to ground shall not exceed 25 ohms unless otherwise noted and should be confirmed by testing.

D. Line Voltage and Low Voltage Power Supplies to all Mechanical Equipment Including Plumbing, Heating and Air Conditioning Units:
1. An electric power supply, including conduit, any necessary junction and/or outlet boxes and conductors and connection shall be furnished and installed by the Contractor for each item or mechanical equipment.
2. Power supplies to individual items of equipment shall be terminated in a suitable outlet or junction box adjacent to the respective item of equipment, or a junction box provided by the manufacturer or the equipment and directed by the Mechanical Contractor. Allow sufficient lengths of conductor at each location to permit connection to the individual equipment without breaking the wire run.
3. The location of all conduit terminations to the equipment is approximate. The exact location of these conduit terminations shall be located and installed as directed by the Mechanical and Plumbing Contractor.
4. Provide power supplies to all plumbing and mechanical equipment, including but not limited to, equipment furnished and installed by Owner or Contractor such as heating and air conditioning equipment, pumps, boilers, auto valves, water coolers, trap primers etc. The installation shall produce a complete and operable system.
5. Unless otherwise noted, the Contractor shall furnish and install all conduit, boxes, wires, etc., for line voltage wiring and low voltage wiring.
6. It is the Contractor's responsibility to verify with the drawings of other trades regarding the extent of his responsibility for mechanical equipment. The bid must include a sum sufficient to cover the cost of the installation.

7. The location of all power supply connection and/or terminations to the mechanical equipment is approximate. The exact locations of these terminations shall be verified with other trades during construction.

E. Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.

F. Firestopping:
1. The Contractor shall be responsible for furnishing all material, labor, equipment, and services in conjunction with the selection and installation of a complete, fully functioning, code compliant, UL-listed, fire stop assembly/system(s) as required by project conditions.
2. Each fire stop assembly/system shall have an "F" and/or "T" rating as required by each condition requiring fire stopping. Each fire stop assembly/system shall have a current UL listing, as indicated in the latest edition of the UL Fire Resistance Directory. Contractor shall verify acceptability of all fire stopping methods and system selections with the authority having jurisdiction prior to installation. The Contractor shall install each fire stop assembly/system in accordance with the manufacturer's printed instructions.
3. Each fire stop assembly/system shall be labeled with fire stop manufacturer-furnished label on each side of the fire stopping systems depicting UL # etc.

G. Housekeeping Pads
1. Provide a minimum 3" high housekeeping pad above finished floor/finished grade for all floor-mounted switchgear, switchboards, distribution boards, transformers, motor control centers, etc., flush with the face of the equipment. Located in mechanical central plant(s), other mechanical spaces, and located outdoors, pads shall be flush with the face of the equipment. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions are met regarding housekeeping pads.
2. Unless otherwise noted above, provide a minimum 1-1/2" high housekeeping pad above finished floor/finished grade for all interior floor-mounted switchgear, switchboards, distribution boards, transformers, motor control centers, transfer switches etc., flush with the face of the equipment. All housekeeping pad heights are as measured from finished floor or grade. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions are met regarding housekeeping pads.
3. Provide a 1-1/2" high housekeeping pad above finished floor/finished for service equipment. Prior to pad rough-in, Contractor shall verify serving utility company's maximum meter height requirements and, if necessary, adjust height of housekeeping pad to comply with those requirements. In indoor applications, the pad shall be flush with the face of the switchgear. In outdoor applications, the housekeeping pad shall extend a minimum of 4 feet from the front of switchgear/switchboard’s weatherproof enclosure. Confirm pad dimensions with

local inspector prior to forming pad to ensure any local code interpretations/conditions are met regarding housekeeping pads.

4. All housekeeping pads located in, on or attached to a building shall be seismically braced/connected to the building structure.

END OF SECTION